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The Cañons of the Snake and Columbia.

A Lecture Delivered Before the Geographical Society, New York, 1870.
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[Continuation.]

THE cañons of the Snake are little known. LEWIS and CLARKE did not follow down this stream, being deterred by the forbidding nature of the country, which was destitute of food. The geography of the region being then wholly unknown, they were endeavoring to strike the headwaters of the Columbia, in order to follow it down to the infant settlement of Astoria; and finding no salmon in the upper course of the Snake, LEWIS acutely inferred that either there were great falls in this river, or it did not belong to the Columbia system. The former of these suppositions was true; and LEWIS may be said to have seen with the eye of faith the great falls of the Snake. Recrossing the continental divide and turning northward, these bold explorers finally reached their destination by an easier route. FREMONT subsequently descended the stream further than they had done; but he likewise abandoned its course, striking northward for a more favorable line, and apparently just missing by a few miles the sight of the great falls.

Like the cañons of the Colorado in the South, the channels of the Snake and other rivers of this region are carved by the streams themselves deep into the face of the country, leaving a general table-land above. The Colorado seems, however, to have had easier work, by reason of the softer nature of the predominant rocks. The characteristic formation of the Snake and the Columbia above the Cascades is basaltic—the product of vast lava overflows. The sublime group of mountains in Oregon and Washington, which includes Hood, Adams, St. Helen's, Regnier, and Baker, with others scarcely less magnificent, is volcanic. Some of these peaks have been in active eruption within recent years; and all are known to have been so at some former period. But we have not to look for volcanic craters as the centres of the great lava floods which covered so much of Northern California, Oregon, Washington, and Idaho. These craters are scattered along a distance of five hundred miles in the Cascade and Sierra ranges, but it seems probable that a line connects them, upon which the eruptions of melted lava took place abundantly, repeatedly, but perhaps more silently than is apt to be the case with the explosive phenomena of volcanoes. A plutonic dyke may be traced along the sierra, and is asserted to have been observed in a considerable sectional exposure in one of the deep side cañons of the western slope. If we are yet ignorant of the geological history of these phenomena, it is merely because we have not yet had time to collect and compare observations. There are few regions on the globe where the handwriting of nature is larger, plainer, or less obscured by nature's own subsequent efforts to erase it. Geologists who have painfully endeavored to find in railroad cuttings, wells, or rare accidental exposures, the view of the structure of the rocks which forests and alluvion otherwhere concealed, will appreciate the ease and satisfactory character of reconnoissances in a wilderness, where the mountains are bare above, and cloven with cañons that reveal their very hearts.

One of the first things that strike the observer in these basaltic layers, is their great aggregate thickness as well as superficial extent. This is shone finely just above the Dalles, and in the cañon of the Des Chutes. For a considerable distance along the Dalles, the banks of the Columbia present a low volcanic escarpment, like the Palisades of the Hudson, but absolutely barren. At some points, however, the whole thickness of the mass through which the river has carved its way stands revealed. It presents to us a series of overflows, each spreading out horizontally, and succeeded after an indefinite interval by another. The aggregate thickness, as shown in the Des Chutes, cannot fall short of 2,000 feet. In different localities, it is easy to distinguish between the layers that have cooled under water (i. e., those which were erupted before the disappearance of the great inland lakes,) and those which have congealed under exposure to the atmosphere. Possibly a still more important clue to the geological history is found in the fact that these basaltic layers enclose intercalated series of sedimentary strata. At Dalles City a bed of lava overlies a bed of conglomerate, and is in turn overlain by deposits of tufa-sandstones and clays, containing the most delicate plant-fossils that can be conceived. There are leaves, twigs, and buds, in the greatest perfection. Perhaps they were brought down by the river in former times. It certainly seems less likely that they should have grown where now they are found. The mud and ashes constituting these intercalated beds may also have been erupted; since we know that nearly or quite all of the volcanic eruptions include the expulsion of vast quantities of ashes and hot water.

At the Cascades of the Columbia, the Des Chutes, and other rivers, not too much obstructed, salmon are speared or hooked in great abundance by the Indians. These fish find their way or more than a thousand miles from the sea, continually pressing up stream, and growing weaker, thinner, and more battered and lacerated by the rough and rocky trip. Those caught at the mouth of the Columbia are in far the best condition; and it is from this place that the great quantities are taken for packing and shipment to market. The Indians, less fastidious, catch their fish wherever it is most convenient, dry it in the sun, and preserve it for winter food.

Passing south-east from the Dalles, and crossing the valley of the Des Chutes, we come into the valley of the John Day's river. The walls of this cañon are of volcanic-sedimentary character, at least in many places, consisting of tufas and sandstones from volcanic materials. The effects upon these soft materials of atmospheric and aqueous agencies have been picturesque and curious in the extreme. At one point a complete ancient castle is perched, like the stronghold of a Raubritter of the Rhine, upon a commanding crag, from which its dwellers might look far up and down the valley. A little further on, a whole city, with towers and roofs of fantastic, quaint variety, attracts the wondering gaze. It is difficult, sometimes, to realize that these appearances are but the freaks of water, gnawing away into such fanciful forms the yielding layers of rock.

A brief trip into the forests of Washington Territory, up the valley of the White Salmon, and nearly to the foot of Mount Adams, gave me an opportunity to study one of the most remarkable features of these basaltic formations, namely, their subterranean passages or caves. I have elsewhere* given some account of these; but I must beg your indulgence for a condensed description here.

The whole country in the neighborhood of Dallas is covered with basaltic overflows, intercalated here and there with beds of tufa, cemented ashes, and even altered clays, in some of which interesting tertiary fossils, both of plants and animals, have been discovered. Rev. T. Condon, of Dallas City, a naturalist whose enthusiasm, patient industry, and wide acquaintance with this part of Oregon, entitle him to a fame which his modesty has hitherto avoided, has brought together a large and interesting collection of these fossil remains, which he exhibits and explains with great courtesy to his friends, among whom, with catholic liberality, he appears to reckon all those who make demands upon his time and manifest interest in his pursuits.

It is in these basaltic overflows, not more than twenty miles from the base of Mount Adams, and in the heart, so to speak, of the Cascade Mountains, west of the valley of the White Salmon river, that a series of caves occur, some of which present the phenomena of perpetual ice. Nature continues the manufacture, and stores the product, year after year, though it is but occasionally that man, exhausting his own resourses, falls back upon her forethought and bounty.

The "caves" are all old lava channels, through which the melted matter flowed, after the crust had cooled and hardened overhead. The same thing may be seen on any volcano; but in most cases, I presume, the molten current gradually clogs and fills the duct, and, cooling, leaves the solid mass. If by any cause, however, the lava should be choked at the source of the stream, I fancy that the portion already in the duct, protected to a great degree from cooling by the solid wall above and on either side would continue to flow for a considerable distance, and leave an empty space behind it. These ducts may be traced for several miles. The ground reverberates hollowly under the horses' feet; and at frequent intervals, where the crust has broken through by its own weight, the descent may be made over great blocks of basalt into the subterranean glooms. We explored one passage for a distance of seven hundred and fifty feet, and found the fissure still continuing at either end, though too narrow to admit of further penetration. But two or three of these caverns have been found to contain ice; and of these only one seems to afford it in abundance and in accessible position. This one we thoroughly examined, and found the subject, upon closer attention, divested of much of its mystery.

To make an ice-cave it is necessary to have a cave. This, as we have seen, is provided by the geological formation of the locality. The next requirement is a communication between the cave and the outer air, giving opportunity for the refrigerating drafts of winter. Finally, a slow percolation of water into the cave, which may freeze solid, in successive layers, throughout the winter. In summer, the ice thus accumulated thaws slowly under the influence of warmer air entering the cavern; but the thawing at one end produces a low temperature at the other, which preserves the great body of ice. Besides, it is a well-known fact that ice formed at very low temperatures will last much longer than that which has been barely frozen at 32°. Hence, the amount of heat that would liquify river ice only brings the cave ice up to the neighborhood of the freezing point. We satisfied ourselves, however, that the ice in the cave does thaw in summer, and the water finds its way out by subterranern channels.

I am strongly inclined to see in these peculiar lava-ducts an explanation of the phenomenon not unfrequent in this region, of "lost rivers." We camped on the excursion to the ice-caves, by the side of a brisk, musical stream, which afforded us abundance of water for our horses and ourselves. Mounting the next morning and riding away, we were surprised to find the bed of the stream, less than a dozen rods below our camp, perfectly dry. A closer examination showed that the water disappeared into one of the subterranean passages in the basalt. Somewhat similar must be the course of the great "lost river" which bursts out of the vertical side of the cañon of the Snake—a torrent from the solid rock; a foundling, rather than a lostling, since it is the origin, not the fate of this river, which is unknown. Above its strange headlong emergence from imprisonment, the black, barren desert stretches for scores of miles, treeless and waterless. Somewhere to the northward, a river has been lost, and here it is. Identified it will be, so soon as its disappearance shall sufficiently interest any of its friends to make them answer the advertisement of its discovery!

The main cañon of the Snake river is cut through basalt for several hundred miles, and in following its course, by riding along the precipitous edge of the chasm, at the bottom of which flows the river, one has excellent opportunity to study both the successive deposition of the layers of basalt, with the signs of intermittence and intervals of rest, and the peculiar columnar structure, perpendicular to the planes of deposition, of each separate layer. Not even the noted example furnished by Fingal's cave could surpass the illustrations afforded in many places by the columnar basalts of this region. The columns are usually six-sided prisms, though sometimes they have five or four sides. This variation, however, is enough to show that the cause of their formation is not analagous to crystalline force. The form of the regular pentagon does not occur in any crystalline form; nor does nature ever confound in the same substance the hexagonal and the tetragonal forms. Probably the shape of these prisms can be explained by a less difficult hypothesis. The cell of the bee, you will remember, is hexagonal in section, and was formerly cited as a wonderful example of geometrical instinct, since it possesses exactly the form which can be mathematically proved to occupy the space of the hive most economically, leaving no wasted interstices, and consuming a minimum quantity of building material. It is now seen that the cell of the bee is spherical in shape, and assumes this economical shape under pressure. It is probable that an analagous result is due in the cooling of basalt to the pressure of the whole mass. The tendency, apart from this pressure, would be to cool in globes; but the vertical pressure converts these into cylinders, facilitating at the same time vertical cleavages through the mass; and finally the lateral pressure through the half-solidified mass modifies these cylinders into prisms. It is natural that most of these should be hexagonal; because a circle can be tangent to six other circles of equal size, and these tangent each to each; and the transformation of these into hexagons would exactly fill the surface. But local disturbances, differences in the size of the circles forming the bases of the basalt-cylinders, and other accidental causes, would naturally lead to the formation of imperfect prisms, or such as had not their full compliment of six sides. And this is the exact state of things as revealed by observation. The hexagonal type seems to be predominant, but not universal.

The size of the prisms or columns is not great—seldom exceeding a foot or two feet as the width of a side. Although the horizontal divisions between successive layers of basalt indicate long periods, possibly, of intervening time, and we can therefore not expect the columns to be continuous through the different layers, yet this is sufficiently the case (i. e., the cleavage planes between the prisms in one layer coincide sufficiently well with those in the layer below) to permit extensive vertical cleavages of large masses of basalt, from the surface down through a dozen layers, to the very bottom of the cañon. I have stood above, with one foot upon the solid basalt, and the other upon the upper edge of a narrow slice thus parted from the main body, while between my feet a deep, long crevice, only a few inches in width, extended down to the base of the cliffs, giving me a glimpse of the river, hundreds of feet below. The manner in which the cañon of the Snake appears to have been enlarged is by the gradual wearing away of the base of its walls by the flowing river and the grinding boulders, and then the toppling or sliding off of these massive slices from the whole face. The walls remain almost everywhere vertical, and the swift stream below carries away the talus of *débris*.

This structure of the basalt greatly facilitates the formation of cañons in it by erosion. No doubt a stream first finding its way through some of the fine crevices left in cooling, enlarges

* ENGINEERING AND MINING JOURNAL, Vol. VIII., No. 13, page 194; OVERLAND MONTHLY, November, 1869.

these at the bottom, and thus produces little by little a wide, smooth chasm. Indeed, it is not impossible that the lost river to which I have alluded may some day, industriously undermining its roof, appear as a visible torrent, at the bottom of a deep cañon.

Many of these features can be studied with great ease, and under the inspiration of glorious natural beauty, at the great Shoshone Falls of the Snake. (The lecturer here sketched rapidly upon the black-board the outline of these falls and of the basaltic cliffs above and below them.) There are no large pictures of these falls at present available; otherwise I should not be so audacious as to attempt to convey an idea of their form—still less of their beauty—in so rude a manner. They are situated about twelve miles above the crossing of the Snake cañon by the stage road from Boise to Salt Lake. They are accessible without much hardship from the Pacific railroad, by twenty-four hours' stage-travel to the station of Rock Creek, and a ride or walk across the sage-desert of half-a-dozen miles. The surface of the country appears to be an unbroken, scarcely undulating plain, dotted with the gray tufts of the sage, and black, here and there, with patches of bare volcanic rock. As one approaches the cañon of the river, its presence is betrayed by the sound of its flowing, until at last one comes suddenly upon its bold brink, and sees the stream six hundred feet below.

The opposite side of the cañon presents an excellent vertical section, showing both the bedded and the columnar structure of the basalt, and thin layers of sedimentary deposits between the successive overflows. The whole thickness of the basaltic formation is about four hundred feet; and below it is revealed porphyry, to the further depth of two hundred feet. Through both of these the cañon has been carved; but it is apparently a much slower and more difficult work for the stream to wear away by honest friction the masses of porphyry than it was to subtly undermine and overthrow the stately pillars of basalt.

The roar of the falls is heard in the distance, and a rising cloud of mist indicates their locality. Riding along the edge of the cliff for two or three miles, we come upon one of the most romantic scenes of the world. We surprise the river at its work. Its basaltic channel was long since complete; and, not satisfied with that, it is patiently sawing, foot by foot, into the porphyry. Below the falls, this rock has been excavated some two hundred feet in depth; and this is almost exactly the height of the falls themselves. There are almost no rapids immediately above, and none at all immediately below; the stream makes practically but one leap, in a sheet, broken at low water by projecting rocks, but majestic in times of flood as the segment of a huge, revolving wheel. Figures are perhaps as impressive as words in such a description, since they leave the imagination freer play in filling up the outlines of the scene. A cañon perhaps a thousand feet in width, four hundred feet deep above the falls, six hundred feet below,* and a great river plunging from one bed to the other—this is the frame of the picture. As if unwilling to leave so grand a beginning without some delicate touches of milder beauty, nature has relaxed the sternness of her desolation, and clothed the gray ruins of the precipices with green trees and grass, nourished by the mists of the cataract. The sun, busy through all the surrounding plains in fierce destruction, here condescends to the graceful labor of scattering diamonds in the foam, and painting rainbows on the mist. A little way above the falls the river divides, enclosing between its two arms a remnant of the overlying basalt, massive and castellated, like a great fortress, defying destruction; and almost on the edge of the falls, protected, no doubt, by this fortress farther up the stream, stands a still smaller relic of the former rocks, a pillar of basalt, upon the top of which was seen by the earliest pioneers who penetrated to this place, an eagle's nest. For a score of years it has remained—how much longer no man can tell—and is still inhabited by the proud and solitary pair whose reign there is none to dispute.

Despite the forbidding appearance of the precipitous cliffs, it is possible to descend into the cañon below the falls. Numerous clefts and fissures extend through the basalt to the porphyry, and by scrambling, sliding and dropping, aided by the stout branches of drooping trees, it is possible to reach the bottom. Many of these fissures are spanned above by natural bridges. Some of them are closed at the top, with openings here and there, through which we may look down into deep, narrow caves, with glimpses, far below, of sunshine and the flowing river.

The view of the falls from beneath, though of course impressive and beautiful, is not the best that can be obtained. The characteristic feature of the scene, the great depth of the cañon above the upper level of the stream, is dwarfed in perspective, and the beauty of the stream just before its final plunge is hid from view by the tumbling waters themselves. The most magnificent aspect, combining in one picture nearly all the elements of power and grace, of bold outline and tender shadow, of towering height above and dizzy depth below, is obtained from a jutting point of the crags below the fall and nearly on a level with its edge. It was from such a position that Mr. CLARENCE KING's party of explorers, suspending their photographer and his instrument in mid-air, as it were, in front of the great cataract, obtained an excellent picture of this unique scene.

I have said enough, I trust, to convince you that the far Northwest has much to show us and to tell us that will be valuable to science and to art. I hope it will not be long before its natural features will be thoroughly explored and described. Pacific railroad parties have crossed and recrossed it, intent rather on the best way to get through its passes and across its wilderness than on the study of its character and history; the miner and the emigrant have traversed it with indifference, save where it promised fruitful farms or golden treasure; the Indian and the trapper have roamed over it, with keen but ignorant observation. But the time for all such imperfect explorations of our great interior has passed. The recent governmental survey of the belt through which the Pacific Railroad runs is a specimen of a more thorough, elaborate and permanently valuable contribution to our knowledge of the continent. I hope it may be followed by others, as well-equipped and as well-conducted as this has been by its young but famous leader, CLARENCE KING, with whose name those of HAGUE and GARDNER are worthily associated. Surely the government of this great country cannot do a wiser or a nobler thing than to give to the world a faithful picture of the mighty realm beneath its sway.

* The height of the cliffs below the falls is 620 feet; the height of the falls is said to be 216 feet.

The Laws of the Deflection of Beams Exposed to a Transverse Strain, Tested by Experiment.

Read before the Association for the Advancement of Science, by W. A. NORTON, of New Haven, Connecticut.

I PROPOSE, on the present occasion, to communicate the principal results of a series of experiments, made with an apparatus which I devised for the purpose of testing the theoretical laws of the deflection of beams exposed to a transverse strain. [The apparatus was described in detail with the aid of several large diagrams. The following description will suffice to give an accurate idea of its essential features.]

It may be regarded as consisting of three different portions, namely: (1) that which supports the stick to be experimented on: (2) that which applies and measures the strain; (3) that which measures the deflection produced. The supporting apparatus consists of two skeleton iron tables, each of which is a rectangular wrought-iron frame, two and three-fourths feet long by two feet broad, resting at the four corners upon cast-iron legs two and a half feet high. The longitudinal bars of this frame are one inch broad by two inches deep. These tables are placed lengthwise on the same line, say a north and south line, and one foot four and a half inches apart. Each of them supports a transverse sliding frame, composed of two wrought-iron bars, one inch by two inches, placed four inches apart, and formed at the ends into two sliding saddle pieces that rest upon the longitudinal bars of the table-frame. These sliding frames can be set at any distance apart, from two feet to six feet. Upon each of them rests an iron plate five-eighths of an inch thick, and fitted by grooves to the two iron bars, so as to be movable in the direction of their length, or crosswise to the lengths of the tables. Upon these plates rest two cast-iron supports, each consisting of an upright pillar, one and one-eighth inches square in cross section and twelve inches high, connected at the bottom with a plate that is supported by four levelling screws upon the sliding plates just described, and at the top with a plate five inches long (crosswise to the table-frames), two and one-eighth inches broad and five-eighths of an inch thick. The nearer edges of the top plates of these upright supports are bevelled off, so as to bring them immediately over the pillars. The stick experimented on rests immediately on these iron plates, and its effective length is the distance between their nearer edges.

The mechanical contrivance for applying the strain to the stick, like the supporting apparatus just described, is wholly made of iron, and consists of an upright screw, turning by means of female screws in two horizontal plates fastened at their four corners to upright columns. These columns are firmly connected with an iron bed-plate, which is placed between the table supports above described, and securely fastened to the floor-joists by long screw-bolts. The screw-head is connected by intermediate pieces with an iron stirrup that rests crosswise upon the stick. There is a special arrangement, which cannot be well described here, by which these intermediate pieces are made to move in a truly vertical direction, and not partake, in any degree, of the revolving motion of the screw. One of the intermediate pieces referred to, is a FAIRBANE's spring dynanometer (essentially the same as REGNIER's). The circular dial-plate reads from one pound to one thousand pounds. By means of the screw, a power of one thousand pounds can be applied to the stick; but in the experiments the strain was in no instance carried higher than five hundred pounds.

The apparatus for measuring the deflection produced, consists of a brass lever of two arms, each five inches long, one end of which is depressed by the middle of the bent stick, and the equal rise of the other is measured by a micrometer-screw. This micrometer-screw reads to one ten-thousandth of an inch. The lever is placed crosswise to the length of the stick and opposite its middle. It passes through a vertical slot in the iron stirrup that rests upon the middle of the stick, and presses by a blunt steel knob against the other side, the farther end of the lever being made slightly heavier than the other, so as to secure a moderate pressure. The arrangement for supporting the lever consists of a wooden strip six and a half feet long, two and three-eighths inches deep, and one-half inch thick, stiffened along the top by a strip of brass. This is secured to the pillars of the two upright supports, by clamping pieces, which firmly hold it at a distance of five inches from the centres of the pillars and parallel to the length of the stick. Upon this supporting strip rests a sliding saddle-piece, having a small flat plate on the top, and adjustable by horizontal screws that pass through its vertical side plates and press against the vertical sides of the wooden strip. Upon the top plate of this saddle-piece rests, by means of four leveling screws, another small plate, upon which the knife-edge of the lever immediately rests. From the vertical side-plate of the saddle-piece that is farthest from the stick, extends a small horizontal bar, six inches long. This lies directly under the farther half of the lever. Near its farther end the micrometer-screw passes through it from below upward, and touches the under side of the lever, at a distance of five inches from the knife-edge support. The contact of its rounded point with the lever is observed with a microscope. The screw-head, adapted to the lower end of the screw, is two inches in diameter. Its outer vertical edge is silvered, and graduated to read to thousandths of an inch; but a small vertical wire fastened to the bar above it, past which the screw-head moves, subdivides the smallest space on the graduation, so as to make it possible to read to the ten-thousandth of an inch. Since the knife-edge of the lever is at the same distance from the point of contact with the upper end of the micrometer-screw, and from that with the middle of the under side of the stick, the micrometer readings are the linear deflections of the middle of the stick. It will be observed that the depressions of the knob of the lever under the middle of the stick, will be the actual deflections; since the support of the fulcrum of the lever is firmly connected with the upright supports of the stick, and will partake of any depression that they may experience from any settling of the apparatus under the action of the force that produces the deflection. It may be remarked here that it was ascertained, by an independent set of experiments, that the actual depression of the apparatus was very small; only from one to three-thousandths of an inch for every one hundred pounds of pressure.

The manner of conducting the experiments will be readily understood. The inner edges of the top surfaces of the upright supports, upon which the stick is to rest, are set at a distance apart equal to the proposed effective length of the stick; either two feet, four feet, or six feet. These surfaces are carefully leveled and adjusted to the same horizontal plane. The lower plates of the upright supports are firmly clamped to the sliding frames on which they rest by portable clamps. The stick is then put in its place, the iron stirrup placed crosswise upon its middle, and connected by a sliding bolt and key with the upper end of the closed spring of the dynanometer. The apparatus for measuring the deflections is also leveled and adjusted. The screw is then slowly turned until the index of the dynanometer indicates one hundred pounds, two hundred pounds, or any other force of pressure it is proposed to apply, and the reading of the micrometer screw indicates the linear deflection of the middle of the stick produced by the pressure applied.

The experiments were made upon white-pine sticks of various lengths, from two feet to six feet, and various breadths and depths, from one inch to four inches. The results are derived from the means of a large number of experiments. As an additional test, the experiments were repeated upon a second set of sticks.

The received theoretical formula for the deflection of beams of a rectangular cross section of uniform dimensions, is $f = m \frac{Pl^3}{Ebd^3}$, in which m is a constant, P the power applied, E the modulus of elasticity, l the length, b the breadth, and d the depth of the stick. For the case of a beam resting freely on two supports, and loaded in the middle, to which the experiments were entirely confined, this becomes $f = \frac{Pl^3}{4Ebd^3}$. If this formula be correct, then the following laws must be true:

(1.) The deflection is directly proportional to the pressures.
(2.) It is inversely proportional to the cube of the breadth.
(3.) It is inversely proportional to the cube of the depth.
(4.) It is directly proportional to the cube of the length.

We will now compare each of these laws with the experimental results obtained.

First Law.—The deflection is directly proportional to the pressure. The following table contains a few of the results that serve to test this law. The first three columns give the lengths, breadths, and depths of the sticks, and the last column gives the difference between the deflections produced by the two pressures given in the column headed "Difference of Pressures."

The deflections for the first one hundred pounds of pressure are not included, for the reason that there is more liability to error in observing the absolute deflection than in observing the increments of deflection produced by each one hundred pounds of augmented pressure, starting from a pressure of one hundred pounds. The actual results for the first one hundred pounds are given, for comparison, at the bottom of the table.

TABLE I.

Sticks.			Diff. of Pressures.	Diff. of Deflections.
Length.	Bre'dth.	Depth.		inches.
2 ft.	4 in.	2 in.	100 lbs. to 200 lbs.	0.0114
"	"	"	200 " 300 "	0.0102
"	"	"	300 " 400 "	0.0090
"	"	"	400 " 500 "	0.0090
4 ft.	2 in.	3 in.	100 " 200 "	0.0459
"	"	"	200 " 300 "	0.0460
2 ft.	3 in.	2 in.	100 " 200 "	0.0159
"	"	"	200 " 300 "	0.0135
"	"	"	300 " 400 "	0.0127
2 ft.	2 in.	3 in.	100 " 200 "	0.0088
"	"	"	200 " 300 "	0.0084
"	"	"	300 " 400 "	0.0080
				inches.
2 ft.	4 in.	2 in.	0 lbs. to 100 lbs.	0.0119
4 "	2 "	3 "	" " "	0.0477
2 "	3 "	2 "	" " "	0.0164
2 "	2 "	3 "	" " "	0.0092

The following table gives the deflections for one hundred pounds, two hundred pounds, three hundred pounds, etc., pressure:

TABLE II.

Sticks.			Pressures.	Deflections.
Length.	Bre'dth.	Depth.		inch.
2 ft.	4 in.	2 in.	100 lbs.	0.0119
"	"	"	200 "	0.0233
"	"	"	300 "	0.0335
"	"	"	400 "	0.0426
"	"	"	500 "	0.0516
4 ft.	2 in.	3 in.	100 "	0.0477
"	"	"	200 "	0.0936
"	"	"	300 "	0.1396
2 ft.	3 in.	2 in.	100 "	0.0164
"	"	"	200 "	0.0323
"	"	"	300 "	0.0458
"	"	"	400 "	0.0585
2 ft.	2 in.	3 in.	100 "	0.0092
"	"	"	200 "	0.0181
"	"	"	300 "	0.0264
"	"	"	400 "	0.0344

It appears from the results given in tables I. and II., that the

deflection is approximately proportional to the pressure; but, strictly speaking, increases according to a less rapid law. The probable explanation of this descrepancy between theory and fact, is that, as the force of pressure increases, the neutral axis of the cross section of the stick shifts its position, and its distance from the centre of gravity of the cross section augments as the pressure becomes greater. From this cause the moment of the resistance to flexure increases indirectly with the pressure, at the same time that it increases directly from the augmented strains of the fibres. The increased moment of resistance to flexure resulting from this shifting of the neutral axis, should be attended with a diminished increment of deflection for the same increment of pressure.

Second Law.—The deflection is inversely proportional to the breadth. Table III. will serve to test this.

TABLE III.

Sticks.			Obs. deflection 100 lbs.	Cal. deflection 100 lbs.	Difference.	Ratios of error
Length.	Bre'dth.	Depth.				
			inches.	inches.		
2 ft.	1 in.	2 in.	0.0423	0.0423		
"	2 "	"	0.0195	0.0211	+0.0016	1.12
"	3 "	"	0.0147	0.0141	—0.0006	1.24
"	4 "	"	0.0106	0.0106	0.0000	
4 ft.	1 "	"	0.2858	0.2858		
"	2 "	"	0.1200	0.1429	+0.0229	1.5
"	3 "	"	0.0983	0.0952	—0.0031	1.32
"	4 "	"	0.0624	0.0714	+0.0090	1.7

The numbers in the column of calculated deflections are obtained by assuming the observed deflection for the smallest breadth (one inch), and computing the deflection for the other breadths, on the supposition that it is inversely proportional to the breadth. The last column gives the ratios of the differences between the observed and calculated deflections, given in the preceding column, to the observed deflections. The observed deflections answer to an increase of pressure from one hundred pounds to two hundred pounds, or two hundred pounds to three hundred pounds. It will be seen that the errors are some plus and the others minus, and that the ratios of error are small fractions. They are, however, too great to be attributed entirely to errors of observation; but not greater than may reasonably be ascribed to differences in the moduli of elasticity of the different sticks, and to the greater shifting of the neutral axis in the case of the sticks most strained, in connection with possible errors of observation.

Third Law.—The deflection is inversely proportional to the cube of the depth.

It soon became evident, in the course of the experiments, that this law could not be regarded as even approximately true, except in the cases of sticks, or beams, whose length bore a high proportion to their depth. The following comparisons of observed with calculated deflections will show that it fails in the case of sticks two feet in length.

TABLE IV.

Sticks.			Ratios of bd3.	Obs. deflec.	Cal. deflec.	Diff.	Ratios of error.
Length.	Bre'dth.	Depth.					
				in.			
2 ft.	2 in.	1 in.		0.1414	in.	in.	
2 "	1 "	2 "	1 to 4	0.0423	0.0353	—0.0070	1.6
2 "	3 "	2 "		0.0147			
2 "	2 "	3 "	1 to 2¼	0.0084	0.0065	—0.0019	1.4.4

TABLE V.

Sticks.			Ratios of d3.	Obs. deflec.	Cal. deflec.	Diff.	Ratios of error.
Length.	Bre'dth.	Depth.					
				in.			
2 ft.	2 in.	1 in.		0.1414	in.		
"	"	2 "	1 to 8	0.0195	0.0177	—0.0018	1.11
"	"	3 "	1 to 27	0.0084	0.0052	—0 0032	1.2.6

The calculated are all less than the observed deflections. The same is true when sticks of greater length than two feet are taken, but the errors are smaller in proportion as the length is greater. It appears, therefore, that the deflection decreases according to a less rapid law than the inverse cube of the depth.

Fourth Law.—The deflection is directly proportional to the cube of the length.

The experiments show that this law fails, as well as the third.

TABLE VI.

Sticks.			Ratios of 13	Obs. deflec.	Cal. deflec.	Diff.	Ratios of error.
Length.	Bre'dth.	Depth.					
				in.			
2 ft.	2 in.	2 in.		0.0195	in.	in.	
4 "	2 "	2 "	1 to 8	0.1200	0.1560	+0.0360	1.3.33
2 "	2 "	3 "		0.0084			
4 "	2 "	3 "	1 to 8	0.0460	0.0672	+0.0212	1.2
2 "	3 "	2 "		0.0147			
4 "	3 "	2 "	1 to 8	0.0983	0.1176	+0.0193	1.5
2 "	4 "	2 "		0.0106			
4 "	4 "	2 "	1 to 8	0.0624	0.0848	+0.0224	1.2.8

[TO BE CONTINUED.]

Accidents on American Railways.

THE attention which has recently been given by scientific associations to inventions intended to lessen the risk of accident to railway trains, demonstrates the practical and theoretical importance of the subject. Comparisons and collations of statistics have so frequently been made as to render the general details quite familiar. Generally speaking, the New England States have reduced the risk nearly to the minimum of European railways. The middle States occupy a middle position in this respect; and, again, Western routes exhibit the maximum of liability. New York State might be classed with New England, were it not that frequent and fatal accidents on the Erie road have swollen the statistics of mortality. The New York Central, the Hudson River, and Harlem Railroads compare favorably with New England routes; while, on the other hand, the Erie has, for three years past, proved most risky to travellers of all American railways. The last report of he State Engineer exhibits the statistics very suggestively:

	KILLED.	INJURED.
New York Central	0	6
Harlem R. R.	0	0
Hudson River	0	5
New York and New Haven	0	3
Rome and Ogdensburg	0	0
Erie R. R.	26	72

By the first five, 11,166,455 passengers have been carried in a single year without a single fatality, and with injury to only fourteen; by the last, 2,192,594, with twenty-six killed and seventy-two injured; and, for two years, taking the six routes, the risk by way of the Erie has been equally heavy. Carr's Rock and Mast Hope have, in fact, become almost historical as scenes of railway horror.

One of the leading causes of American liability has hitherto been constituted by the inferior quality of the rails. In the Welsh iron districts, for example, the worst stuff that can be dignified as iron is universally known as the American rail. This has not been the fault of the iron-master, but has arisen from the almost univeral practice of buying the least expensive article that can be produced, on the part of American customers. The iron-masters have neither concealed the inferiority of the product nor the poverty of the process of manufacture, and have generally preferred to produce good work and guarantee it. The inexorable demand for low-priced iron in this country has compelled them to manufacture poor qualities or retreat from the market; and, to this fact, more than any other, have been due the necessity for almost yearly renewal of rails on American roads, and the financial troubles of leading companies.

Rails manufactured for the European markets are, as a rule, warranted for five or seven years, according to traffic—every rail that fails within the guarantee period being renewed at the expense of the manufacturer. On roads where the traffic is moderate, makers guarantee for thirty per cent. additional; while, on roads of heavy traffic, fifty per cent is demanded. Where, on account of extremely heavy usage, iron rails cannot be guaranteed with safety, it is customary to use steel instead. The introduction of a similar system of guarantee would, therefore, obviate one great cause of disaster by bettering the quality of the iron, and occasioning greater carefulness of manufacture; and, until it is introduced, the maximum of safety on American roads cannot be attained.

The movement in favor of steel rails has, within the past few years, become almost universal on roads of heavy traffic; the production of steel rails in this country having gained considerable headway. For the year 1869, the manufacture was, in round figures:

	TONS.
Bessemer Works, Troy, N. Y.	20,000
Pennsylvania Steel Works, Harrisburg	18,000
Cleveland (Ohio) Rolling Mill Company	15,000
Freedom Iron and Steel Works, Lewisburg, Pa.	15,000
Cambria Iron Company, Johnstown, Pa.	20,000
Total	88,000

The Troy Works had produced, prior to the burning of the mills, in October, 1868, over 2,000 tons, and are now manufacturing at the rate of 20,000 tons a year. The second-mentioned works have been in operation for four years at the rate of 12,000 tons, until last year, when the production was increased fifty per cent. The Cleveland mills produced 8,000 tons in 1868, from steel of Lake Superior iron, and are working this year at the rate of 20,000. The Freedom Works have been producing limitedly for several years—say from 8,000 to 10,000 tons; while the Cambria Company, with a capacity for 25,000 tons, completed the mills in the latter part of 1868, and is, this year, running at full capacity. It may be estimated, therefore, that the home production of 1870 will not be less than 100,000 tons. The American steel rail has been fairly tested, and is held by practical men to be not at all inferior to the Welsh product. The New York Central, Erie, and other leading New York routes, have mostly or wholly adopted the steel rail; while, limitedly, the leading Pennsylvania roads have introduced it at all points of heavy traffic. In the general adoption of steel, or rather, in the application of the Bessemer process to railroads, American companies have taken a leading position. It was only last year that the laying of steel rails from Paris to Marseilles, France, was mooted and carried out; eventuating in the consumption of 137,000 tons from the mills of PETIN, GAUDET & Co., and LE CRUESOT; and steel bridges are to be substituted as soon as iron ore suited to the manufacture can be obtained in sufficient quantity. The former company, in 1868, supplied the New York Central with 5,100 tons, being the first to compete with English companies in the American market; and, during, the past year (1869), the iron-masters of France have supplied over 60,000 tons of the American demand; the English importation of steel rails having triflingly exceeded 125,000 tons. Taken all in all, therefore, the American consumption of steel rails is now at an average of over 300,000 tons per annum, of which rather less than one-third is American product.

There is still considerable distrust of the Bessemer process in scientific circles. High authorities aver that, where safety is the consideration, Bessemer steel is not reliable, owing to frequency of flaw, incident to the pneumatic process, not likely to be discovered in testing, unless tests are of the most rigidly unerring kind, application of which is tedious and expensive. Obviously, this being the critical objection to the Bessemer product, its application to railways ought to be accompanied with a rigid system of tests, such as was recently described in the ENGINEERING AND MINING JOURNAL, as in use at the works of JOHN A. GRISWOLD & Co., at Troy.

THE PHILOSOPHY OF FRACTURE

constitutes a topic which has long engaged the attention of practical engineers. Observation supplies the fact that, as a rule, rails always break near the end—very seldom in the middle or near it; and even very superficial observers have not failed to notice that, on many roads, the ends of rails present the appearance of having been subjected to great and repeated concussion. Concussion is more or less severe in ratio to the gape between the ends, if that exists, or any projection of the end of either rail above the general level, occasioned either by defective laying or inequality of wear in the two rails thus jointed. Suppose, for example, that the projection of the corner of the one rail above that of the other be—as observation supplies numerous instances—less than one-thirtieth of the whole thickness of the rail. Passing over the track, in one direction, the concussion on or near the end of the rail is equal to the momentum of the weight resting upon the forward wheel of the engine, in the first place, succeeded by just as many strokes, rapidly repeated, as there are wheels on that side of the train; while, passing in the other direction, the concussion is equal to so many strokes dealt rapidly upon the projecting corner. In the first instance, the stroke is in the nature of a drop, modified by the forward motion of the train; and the rail is struck, not with a full downward momentum, but diagonally, near the end—the angle being more or less acute, according to rapidity of motion, and the blow being equal to the weight of the whole added to the momentum generated by motion. In the second instance, the blow is equal to the momentum of the train added to the weight of the whole, striking against the projecting corner. The liability to fracture is nearly the same in both instances; and—given: the weight of the engine, the number of cars with ascertained weight, the rapidity of motion, the exact height of projection, and the strength of the rail—any engineer of good capacity would be able to calculate how many times the train must be passed over to produce fracture. Yet it is nothing uncommon for rails to be left in this condition for days; thus extending an invitation to accident.

Again, in instances where there is an appreciable interval between the ends of rails, the laying of which is level, there is an almost equal volume of concussion, which, however, is mixed in elements, that is, partly drop, and partly in the nature of a blow upon the exposed corner of the rail. In either problem, the conditions given, the deviation of the rail may be calculated with approximate accuracy; and, under all circumstances, there is a certain greater liability of fracture near the end, other things being equal, than anywhere else, owing to the fact that the solidity of the track at the point of jointure can never be equal to that elsewhere where there is no joint. Hence, as a rule, unless there is great defect of road-bed or definite flaw in the middle of the rail, fracture occurs within two or three feet of the end; and this leads to the enumeration of the

MAIN CAUSES OF ACCIDENT

on American roads. They may be conveniently classed under their appropriate heads, as:

1. Defective rails, that is, rails manufactured of inferior stock, liable to flaws, not sufficiently tested previous to laying, and not guaranteed by the manufacturer. Under this head falls, also, the fault of defective putting down, but too common on American routes and necessarily incident to the contract system.

2. Defective road-bed, that is, road-bed too hastily and imperfectly constructed to fulfil the conditions of good engineering, which is one of the besetting sins of American contractors. Inadequately ballasted, inadequately drained, and, therefore, unsafe, would constitute the three counts of criticism on most American roads, if subjected to the scrutiny of engineering critics, especially as concerns routes west of the Alleghany ridge. Under this head must be included defective bridging and culverting. Blame not the engineer. In most instances, he is so hedged about with limitations as to cost as to be practically bound and delivered over to the enemy.

3. Defective training of employees, to which must be referred most collisions, like the Mast Hope disaster and half a dozen others more or less terrible in casualty, that have become historical.

THE NATURAL REMEDIES

are obvious from the nature of the defects. Firstly, by statute companies should be prohibited from laying rails which cannot be guaranteed for from five to seven years, according to traffic. If the traffic is moderate, iron rails will answer and can be guaranteed for the average period. If heavy steel rails should be put down under similar conditions of guarantee; and it should be made a misdemeanor of heavy penalty for any corporation, or agent or conductor of said corporation to lay unguaranteed rails either of iron or steel. The system once adopted, iron-masters having no interest in the manufacture of inferior rails, would cease to convert the worst qualities of iron into rails; and there is no remedy—corporations having neither bodies to be kicked nor souls to be damned—except in legal statute of this kind. To hold corporate bodies responsible in damages, has been proved by long experience to be fallacious; and, on account of their great pecuniary influence, criminal prosecution of officials will always prove equally ineffective. The remedy must eradicate the poison from the system; and to apply minor remedial agents is to fight yellow Jack with batteries of tomatoe-pills. The reform must begin with the introduction of the English and continental system of guaranteed product. Other considerations are minor, and fail to cut the root of the evil.

Nor is there any doubt of the economy of the guarantee system. As it is, the renewal of rails on many American roads is almost annual. On others, it is estimated as biennial; and rails that last four years are quite exceptional. Under the European system, the renewal, if occurring at all within the specified period, would be at the expense of the manufacturer, which imposes an effectual limitation on the dishonesty of the latter. Space to exhibit statistical induction need not be wasted. The result of calculation and comparison proves conclusively that the European system would lessen the cost of repairs over seventy-five per cent., which, upon comparison of figures, will be found to compensate for the augmented cost of the iron once every two and a half years. In fact, separating the run of a road into periods of five years, the expense to the

company of laying down and renewal, taking the two together, would be lessened on the average rather more than forty per cent., by using the best attainable materials in the first place. Short-sighted as the present system is from an economical point of view, what shall be said of it when it is considered that every defective rail put down is put down at the risk of the travelling public; and for what reason is the pitiful villain who deliberately plans to have a train from the track, possibly for purposes of plunder, more criminal than the railroad company that lays down an accident in the laying down of every rail? His act is isolated, risking the safety of a single train; while the prevalence of the present vicious system endangers the safety of every train, patron and passenger.

THE QUESTION OF ROAD-BED

is less easy of solution, owing to the distances traversed by American railways. In the Eastern and Middle States, construction is amenable to less unfavorable criticism than elsewhere, though less elaborate than in England or on the Continent. In America the problem of the engineer has been to construct, no matter how difficult the route, at the least expense; in Europe, it is as if the engineer had gone out of his way to be expensive. A tunnel is the hobby of the European engineer, and he never neglects the opportunity of building one. From Havre to Paris, for example, along a river route through an even country, tunnel after tunnel of the most expensive sort occurs, when the fact is obvious that most of them could have been avoided, and, in this country, would have been. Bridges over inferior and remote streams are most elaborate structures of solid masonry; while the ballasting of the road-bed is the very climax. The result is the reduction of risk, far under the American standard, and a rarity of accident that would render even a trifling affair a novel sensation for European journals. A European railroad, like an Egyptian pyramid, is as if built for eternity; an American, as if intended to illustrate the force of the adjective, *ephemeral*. In stations, America is equally inferior. In London, Paris and all European cities, railway stations are among the most beautiful and substantial edifices; here, among the most unsightly and temporary-looking.

It is true that American railways traverse larger tracts of country; but, in the West, the surface is generally favorable, while, in the East, the distances are less; and, in both regions, with good surveys of route, deep cuts, tunnels, and great filling-in may be avoided altogether. On the whole, the objection, on the score of distance, is less valid than it appears. The principle in America is to use railways as means of developing tracts of country; while, in Europe, the railways pursue, rather than precede, material progress, which may be bad for the country, but is certainly good for the railroads.

As a crystallization of progress, it is a notorious fact that the railroad contractor in this country is both ignorant and unscrupulous. Specifications are either avoided or superficially complied with—the considerations most affecting the contractor being to make the most money out of his job, and yet to give his work sufficient appearance of solidity to insure acceptance. The tendency being to superficial engineering, defects that can be conveniently masked are not removed by good work on good foundation—to which cause, resulting in imperceptible yield of the road-bed under pressure, may be attributed most of those inexplicable fractures of rails and breakages, the causes of which coroners fail to elicit. The needed solidity wanting, the road-bed settles imperceptibly under weight; and a dozen cases for the coroner ensue.

It may be true that capital cannot be procured here to build on the European model. The fact, remains, however, that it is better not to construct at all than to construct unsafely; and very few American roads are up to the standard of good engineering. A competent board of inspectors, composed of the best engineers in the country, and appointed by Government, would constitute, perhaps, the best remedy that could be suggested; and the day of a board of the kind indicated is by no means distant. Till then, the contract system, with all its inherent viciousness, will have its own way; till then, accidents will be of frequent happening. In fact, under the present system, accidents are rather incidents than accidents.

THE UNRELIABILITY OF EMPLOYEES

is a part of the American system, responsible, in its way, for many disasters—particularly in the way of collision. The standard of special education to the business in this country is depressed far beneath the European standard; and this is true of all departments, from flagman to engineer, from brakeman to conductor. Inventions looking to the obviation of accident—as the MILLER platform, the safety brake, and a hundred other devices—have been inventions to mitigate accident merely; very valuable in lessening casualties, if accidents must occur, but not preventive. The liability to accident results from causes inherent in the American system, and can be obviated only by beginning at the beginning. To argue otherwise; to parade preventives, as many scientific men have done, smacks of quackery—suggests the epithet, humbug. American roads are, on the average, far better equipped than European. Engines are larger and better constructed; cars are superior in all respects. Signal ropes, universal here, are almost unknown in Europe; the Paris and Calais road, and a single English railway being the only instances of their use; and yet, in England trains are run at a speed seldom attempted here. The Limited Mail, London and Edinburg, runs sixty miles an hour, inclusive of stoppages, taking water with train in motion, and fifty miles an hour is nothing exceptional for an English train. Yet collisions are unknown. The whole is as regular as clockwork; has all the arbitrariness of military rule; demands the implicit obedience of police system. You may—this; you must not—that; you cannot—the other thing; and to argue is to waste breath and tongue. The traffic is enormous; the number of trains run, extraordinary. There is a point in London where trains average one in three minutes all day, and one in four and a half minutes for the whole twenty-four hours; yet there is no collision, no confusion, no accident. The system is arbitrary; but travel is safe and rapid.

The result is due mostly to the superior reliability of employees on European roads, and is as creditable to European corporations as its absence is disgraceful to American—for, on the average, with less speed, less frequency of train, and great superiority in rolling stock, more than one-third of all accidents on American roads are due to the incompetence or unreliability of employess. The remedy is to be sought in compelling corporations to employ men, trained by regular apprenticeship of the most rigorous limitations in every department—with the further proviso that the men are to be intelligent enough, to begin with, to be susceptible of thorough training; and until these several indicated reforms in the American railroad system are brought about, it is useless to expend brains in the elaboration of inventions. F. G. F.

MINING SUMMARY.

Missouri.

THE MISSOURI REDUCTION COMPANY.

The St. Louis *Journal of Commerce*, says of this new enterprise: "Some months since, HENRY LYNCH, Esq., of this city, associated with some other citizens, and formed a company under the obove name, for the purpose of establishing in this city works for reducing gold and silver ores, which are now transported from the mining regions by rail to Newark, N. J., to be reduced and separated. It costs from Ogden City, Utah, to Newark, $250 per car load, or $25 per ton. A yield is obtained from them sufficient to make their transportation profitable, even that great distance—3,000 miles. The heavy tax upon the profits by the freights over this long line of railroad is an illustration of the disadvantages and expense of having the raw material a long distance from the place of manufacture. Were the supply of ore in the Western mines limited in quantity or poor in quality, it might be better to send it even as far as Newark for reduction. But as it is practically inexhaustible, it will pay to construct works near the mines. If they can be made a source of profit in New Jersey, they can be made so in St. Louis. That this business proves profitable to the moulters is evidenced further by the fact, that an English company, established in Colorado, ships ores to England for reduction, and even takes up the tailings, etc., for that purpose. As the territories lying west of us are developed by a producing class. they will become to the same extent consumers, to be supplied from the storehouses of the city cultivating the most intimate relations of trade—an exchange of commodities, every mine opened, therefore, will give to our merchants customers. Every ton of ore transported, will give to our coal-miners added employment. Every ton of ore smelted here, not only brings us into more intimate relations with the territories, and adds to our local mining prosperity, but will give employment to men here in the city; will add a new article—bullion—to our commerce, and in the reworking of the refuse for its sulphur, peculiar silica, etc., will stimulate new and different manufactories. It has been shown by gentlemen who have carefully investigated the matter, that the class of gold and silver ores which would be sent here for reduction are inexhaustible. The territory of Utah appears to be rich in them. Dr. LATHAM has a collection of the ores at the Union Pacific offices in Omaha. They come from lodes yielding from 300 to 400 ounces of silver, and from 1,000 to 1,200 ounces of lead to the ton of 2,000 pounds. This gives, estimating the minimum value of silver, $1,550 in silver, and about $170 per ton of lead. The mines indicated are in the vicinity of Salt Lake, and there are in the locality literally mountains composed of this ore, shipments of which are now being made to Newark, N. J., for reduction. Crude silver ore has been shipped from Salt Lake, as follows:

April	6 cars.
May	27 "
June	46 "

"It is anticipated during the present month, at least 150 car loads of this metal will pass east. It is undoubtedly true that the mining regions of the West have been, as yet, only partially explored, and even those portions that have been mined, contain the most valuable portions of their ores awaiting erection of reduction works that can be reached at reasonable expenditure for freights. The early completion of our Kansas Pacific to Denver, will give us direct connection with the mining region; and our Colorado exchanges urge St. Louis to take some prompt, active steps for establishing works here. Letters have been received in this city from Colorado miners, who are willing, nay, desirous, to ship ore to this city, receiving in pay therefor similar prices to that paid by the English company referred to, the New Jersey smelting works, or to accept as full pay what remains of the metals after deducting one hundred per cent. profit to the reduction company. An offer thus liberal will, we trust, stimulate our manufacturers to equal enterprise, and lead them to carefully consider the importance of acting promptly, and by establishing works of that kind here, stimulate our manufacturing and industrial interests, inaugurate a profitable business which has no competition, and what is quite as important, establish intimate business relations and an interchange of products with the rapidly growing mining districts, which should inure to the benefit of our bankers, merchants, manufacturers, and business men generally."

Nevada.

THE COMSTOCK MINES.

The bullion production of leading claims on the Comstock Lode for the first six months of the year compares as follows:

	1869.	1870.
Belcher	$8,280	$194,536
Chollar-Potosi	665,637	812,890
Confidence	18,889	.....
Crown Point	105,718	95,557
Empire Mill	93,914	.....
Gold Hill Quartz Mill	34,345	8,048
Gould & Curry	53,796	285,625
Hale & Norcross	447,511	919,118
Imperial	230,947	.....
Kentuck	243,772	146,192
Occidental (estimated)	180,000	.....
Overman	156,671	321,053
Savage	943,217	61,925
Segregated Belcher	4,839	39,575
Sierra Nevada	88,165	85,424
Yellow Jacket	680,000	855,000
Totals	$3,955,701	$3,814,943

The amount for the first six months of 1868 was $4,373,511, of which Savage produced $1,528,000: Crown Point, $631,000; Kentuck, $570,000; Yellow Jacket, $360,000; Imperial, $355,000; Chollar-Potosi, $229,000; Hale & Norcross, $288,000; Overman, $157,000; Empire Mill, $104,500. The returns from Yellow Jacket are mere estimates, no information being obtainable from the company.

The annual meeting of the Savage Mining Company was held at San Francisco on the afternoon of July 21. In view of the depressed condition of the mining interest, President BULL, in his report, suggests that the Savage unite with one or two other companies in the use of one set of hoisting machinery, thus saving a considerable item of expense. He also suggests a reduction of wages among miners, but admits it to be a diffibult task, so great is the labor combination against capital. He says: "Either actual free labor must prevail between the employer and employed, or manp of our precious metal bearing mines must cease being worked." By free labor, is meant the right to employ whom you will, and upon such terms as an agreement can be made. From the secretary's report, we condense the following:

RECEIPTS.

Bars received from mine	$281,570 27
Ores sold at mine	9,945 00
Tailings sold at mills	4,576 60
Assessments Nos. 4 and 5	280,000 00
Miscellaneous	2,397 87
Total receipts	$578,039 74
Cash on hand July 10, 1869	47,395 29
Total	$625,435 03

DISBURSEMENTS.

Labor and salaries	$231,396 12
Timber and Lumber	32,751 21
Hardware, candles, oils, etc	36,080 70
Wood and charcoal	50,510 65
Reduction of ores, etc	106,581,83
Advanced to Truckee Railroad	75,000 00
Custom mills	30,524 67
Miscellaneous	53,144 60
Total disbursements	$615,989 78
Cash on hand July 11, 1870	9,445 25
Total	$625,435 03

Following are the names of the Trustees chosen for the ensuing year: M. MORGANTHAU, I. STEINHART, WM. H. SHARP, E. J. BALDWIN, and A. GOLDSMITH.

RAILROAD DISTRICT.

A letter from Railroad District, dated July 27, says: "The furnace at Bullion City has played the game of 'freeze out' so often that in spite of the scorching rays of the sun, things seem a little chilly. The fact is, Railroad District has been the victim of a cruel experiment. From various sources I learn that the furnace erected here is one that never has worked, and if its history, connected with the efforts to smelt the rich galena ores of Railroad is at all prophetic, it never will work. Such, I believe, is the conclusion generally arrived at by all parties, and the ground is already broken for a new one—one of the old-fashioned stone furnaces, which all know will work. There is no lack of ore from a dozen mines. The Red Jacket is turning out galena rich in silver. The Dalles, a ledge about six feet wide, shows $59 in silver, with 15 per cent. in copper. The Webfoot, Last Chance, and in fact most of the galena ledges here, are showing large quantities of ore. Oh! for a furnace!"

GALENA DISTRICT.

The Humboldt *Register*, July 30, in an account of the mines of this district, says: "The mines are rich and extensive, and the rumors that some of the leading mines had 'petered,' is entirely without any foundation. The Butte is working sixteen miners, the Shiloh and White mines about the same number, and the Avalanche, owned by the DUNN Brothers, has been leased to a San Francisco company. The English company, in Copper Canyon, employ about fifty men. They have, unquestionably, the richest and most extensive mine in the State, if not on the coast. The Little Giant, at Battle Mountain, still continues to pan out handsomely. The mill is kept running day and night, and the town of Battle Mountain is, after all, about the loveliest mining camp there is in the county."

FROM CAPE DISTRICT.

A correspondent of the Elko *Independent* furnishes the following items of mining news: "The Crescent Company has just had 210 tons of ore worked at the Atchison mill, which gave an average yield of $234 per ton—falling much below the expectations based on assays. The Crown Point (CUTLER & Co.) has a shaft down 25 feet, in a large body of ore, milling $100 to the ton and upwards. FULLER & FURGERSON have commenced work on the Great Eastern, with good prospects, the ore assaying from $250 to $300 to the ton. The Ada Gossage, located one mile and a half from Mountain City, and owned by HENRY, VELT, UPTON & FREDERICK Brothers, has a shaft 70 feet deep, and ore assaying from $300 to $500 to the ton. The Argenta, Argenta Excelsior and Argenta Extension are all looking well. The SUNNY Hill, three miles southeast of town, Keystone and Virginia are being actively worked and look well. The Mountain City S. M. Company (OPPENHEIMER, HART and others) has out a large quantity of good ore, which will be crushed as soon as the Vance mill is in readiness. Placer mining by Chinamen, on the north side of the river, is going on actively, but water is scarce. The Chinamen make from two to three dollars per day, but competent judges, who have examined the ground, believe that if water were plenty the mines could be made to pay $10 per day to the man."

Arizona.

MINING MATTERS, ETC.

From the Prescott (A. T.) *Miner* of July 9th, we collate the following: "The news from Southern Arizona is to the effect that on the 9th of last month the savages pounced upon Gardener's ranch, near Camp Crittendon, killed DAVE HOLLAND, took a Mexican boy prisoner, and drove off several head of horses. Also, that Indians had attacked a ranch near Tubac, killed a Mexican, and wounded a Mr. SMITH. But the worst, most painful news is a rumor to the effect that CHAS. MEYER and nine or ten other men, had been killed near Florence, on the Gila. The rumor, however, needs confirmation, and we forbear from commenting upon, or believing it, until hearing further particulars. It is said that Mr. CLINTON, of this place, was with the party. Again, at Tuscon, one night recently, some Mexicans went to the house of Major M. B. DUFFIELD, and, to satisfy an old grudge, cut him up shockingly with knives. The Major was asleep, when the semi-civilized and cowardly devils attacked him. At last accounts he was in a precarious condition. Three soldiers belonging to Capt. HAWLEY's command were wounded in the recent Indian fight east of the Verde. The particulars have not yet been obtained.

"Our present prospects are very encouraging. It commenced to rain here June 30th, and has rained heavily every day since. The crops, as a matter of course, are growing like sixty. Mining industry was never before more prosperous; the mills now running are paying well; many new and rich mines have recently been found, and more are being discovered every day. The Territory has been created into a military department, and one of the bravest, ablest military officers that ever drew a sword is here in com-

mand, determined upon subduing the Indians; constructing wagon roads, and doing good generally, in all of which he will be ably seconded by his officers and men, and by our citizens, who are highly pleased at having such a commander. We have the promise of better mail facilities, of immigration; of thousands of head of stock, which latter are now on their way from Texas, and last, but not least, a railroad. So that we can once more hold up our heads and invite people to come here and settle.

"The Vulture mine is looking better than it has for the past two years. During that time they have been sinking shafts and running levels to open the mine, and up to the present time are at work on one stope only. There is at least four years' ore in sight. The vein matter, at the bottom of the main shaft, is 7½ feet wide, with 4 feet of highly concentrated pay ore on the eastern side of the vein. They are about to sink another hundred feet in the main shaft. This, with the levels that will be run from it, will make the Vulture the best of the great mines on the continent. Its capacity for producing rich ore seems unlimited. The mill is running steadily. Last week they took out two of the old mortars and replaced them with new ones, and now the whole forty stamps are running again, and producing as fine results as they have at any time during the past two years.

"The Accidental lode, Walker's District, will some day enrich its owners. We have specimens taken from it a depth of over 100 feet below the surface, which are astoundingly rich in gold. The pay streak at that depth is over three feet in depth.

"JACKSON MCCRACKIN, JAS. FINE, CHARLEY TAYLOR and T. G. HOGLE, arrived in Prescott yesterday, from the Bradshaw Mining District, about 30 miles south of Prescott, with a lot of the richest gold-bearing quartz we have ever seen, from a ledge recently discovered by them, on the summit of the Bradshaw, not far from the heads of Black Canon and Bear Creeks. The ore is decomposed, and yields about $1 to the pound. The ledge is a "blind" one, and so far as known, the pay-streak averages from 30 to 36 inches in width. The country in which this rich finding exists is well watered, timbered, grassed, and filled with game, such as bear, deer, and turkeys. The ledge is not to exceed 30 miles from Prescott. Several holes were sunk upon it, for prospecting purposes, and in this way it was proven that the vein, for 300 feet, carries plenty of free gold. The gulches making down from it contain sufficient gold to remunerate parties for working them. The party are so well satisfied of the richness of this mine, that they intend returning to it in a day or two, with tools, provisions, etc., to work it.

ON DIT ABOUT MINES AND METALS.

Tin in Kansas.—Kansas papers say that a rich vein of tin ore has been discovered on the Smoky Hill River.

Straits of Magellan Coal.—It is said that the coal from the Straits of Magellan is getting more and more in demand. Its quality has been attested and certified by the Peruvian squadron and the Russian corvette of war *Almaz*.

Missouri Iron.—The cost of mining and loading iron ore on cars at the iron mines of Missouri is estimated at 90 cents per ton. It brings $5 50 per ton at St. Louis, and after deducting the freight, $1 90 per ton, a profit of $2 70 per ton is realized.

Rich Silver Discovery in Peru.—The rich mines of silver discovered five leagues from the town of Calama, Peru, has drawn great crowds of people there. The authorities of Atacama have had to send forces to preserve order. The argentiferous strata give 4,000 to 5,000 marcos to the *cajon*.

Ohio Grindstones.—The Rolla *Express* says: "Grindstones of a quality superior to those of the Baldwin Works in Ohio are now manufactured in this county, by Mr. FOLKENROOD, from stone found on his farm. Mr. F. has shipped several car loads of these grindstones to St. Louis, and found ready sale for them at good prices."

Rich Iron Ore.—The *Scientific Press* makes the following strong point: "Considerable excitement is reported as occasioned in Tazewell and Fulton counties, Illinois, by the discovery of bog ore containing 95 per cent. of iron. We should ourselves be considerably excited if we found this percentage in any ore. We give notice that we are about to discover some ore holding 125 per cent."

The Snake River Mines.—News from Snake River mines comes by way of Corinne. A telegram from that place, July 12, reports that work in the mines commences under the most favorable auspices. The men are making from five to twenty dollars per day. Mining tools and supplies are very scarce and high. It is the opinion of old miners that the diggings will be perpetual; that the bars worked out this year will de replaced by next year's freshets.

Yarmouth Gold Mines.—It is reported that operations at the Yarmouth gold mines, N. S., are progressing steadily and satisfactorily. The shaft nearest the shore has been sunk to a depth of about 100 feet, and the quartz is found to increase in richness with the depth—the last lot taken out (of 9 tons) having yielded over one ounce to the ton. As the work proceeds, the lode is found to increase in thickness, and at the depth now reached is fully six inches thicker near the surface.

Singular Coal Mining Operations.—Some interesting mining operations are now being prosecuted at a colliery belonging to the Earl of DUDLEY, not far from his Coneygre furnaces, in the Tipton district. This section of the Dudley estate has probably been the most prolific in the world, so far as the actual yield of coal is concerned. It has been in work for more than a hundred years, and yet its resources hold out satisfactory promises of reward to the persevering efforts of those engaged in the present experiment. In some parts of the district, on the east of Dudley, coal is not to be found until the mine reaches a depth of 250 yards; in other parts, as in the celebrated twelve-yard-thick measure at Fox-yards, near Sedgley, the coal crops out at the surface, and may be carted away for almost the cost of loading. In most cases the coal lies in a pretty nearly level condition, and may be worked in the ordinary way, viz., by a pit shaft sunk perpendicularly into the earth, from the bottom of which "gate roads" are driven; but in some instances the coal lies in such an oblique position, that to "win" it in that manner involves great cost and danger. To overcome the difficulties of getting the coal where it lies in this oblique position, the experiment under notice has been resorted to. It consists of two tunnels driven from the surface of the earth into the mine, at an angle of about thirty degrees; these tunnels are lined with substantial brickwork, and the "skips" and their contents are drawn up the inclined railway, which is laid down for the purpose, by an ordinary stationary engine fixed on the surface. The coal already got in this way is only a few yards from the surface, and is found to be of a good serviceable quality. Similar experiments were made near Bilston twelve months ago, and the works are in successful operation there.—*Birmingham (Eng.) Gazette.*

SPECIAL SCIENTIFIC BREVITIES.

Buenos Ayres Harbor.—An experienced engineer, sent out by M. LESSEPS, has arrived in Buenos Ayres, to survey the port and report on the practicability of making a harbor. Señor SARMIENTO, in his message, referring to this matter, admitted the urgent necessity of providing for the increased national commerce, and expressed a hope that within two months the new harbor works will be commenced.

Glycerine for Leather.—A patent has lately been issued for the use of glycerine in what is called "stuffing" leather. The "stuffing" contains about one-fifth part of glycerine by weight. It is claimed by the inventor that this will add both firmness and strength to the leather, while at the same time the glycerine will not evaporate nor harden as like oil. The glycerine used in this process is the commonest kind, not clarified, and worth, at wholesale, about 18 cents per pound.

Forms of Animal Life.—Professor GEORGE ROLLESTONE, of Oxford, in his late book on "Forms of Animal Life," gives a new criterion by which to distinguish animals from vegetables. He says that in the case of all animals the embryo absorbs its yolk from the inside, while in vegetables the germ of seed is surrounded by its albumen. This is a remarkable foreshadowing of the way in which the adult animal or plant absorbs its food, the former by placing it within itself for digestion and assimilation, while the latter takes its food from outside.

A Geological Question.—It is allowed by all geologists that the Isthmus of Suez is the bed of an ancient sea. But how it became dry has not yet been decided; some observers are of opinion that its present condition is the result of an elevation of the land, while others maintain that the true cause has been a subsidence of the sea. M. REY DE MORANDE, who has examined the locality, and has just published an essay on the question, says that there is no evidence of elevation of land, and thinks that the sea, which once covered the isthmus, has been gradually dried up.

Compressibility of Gases under High Pressure.—We find in the *Chemical News* a notice of a paper on the above-named subject. The author has studied the variation of compression of air and hydrogen between 1 and 800 atmospheres. Up to 80 atmospheres pressure, air is more compressed than it should be if it followed the law of MARIOTTE, and at 680 atmospheres it only occupies two-thirds of the space, which it ought to do theoretically. The method by which the author is enabled to measure the volumes occupied by a gas in an opaque apparatus is very simple. The glass tube is enclosed in an iron one, the former containing the gas, is lightly gilt. The mercury which serves to transmit the pressure whitens the gold, leaving a well-defined mark upon it after the pressure ceases.

Mechanical Firing.—An article in *Chambers' Journal* (an English monthly), entitled "Science and Art," refers to a paper "On the Mechanical Firing of Steam Boilers," read at a recent meeting of the "Institution of Mechanical Engineers." This paper shows that if the coal is brought gradually into the furnace upon an endless iron web, a much smaller quantity is consumed, and the engine does more duty than when the furnace is fed by hand. The Vicars mechanical furnace in use at Seaham colliery, county Durham, is described as the most successful of all, inasmuch as it will burn the small coal known as "peas" and "duff," and which can be bought at the pit's mouth at from one shilling to three shillings per ton. Another advantage of the mechanical furnace is that it consumes all the smoke.

The Leclanché Cell, which is largely used in the batteries of the French telegraphic system, is thus reported on by Professor MORSE: "This battery consists of a prism of carbon for its positive pole, which is surrounded by a mixture of peroxide of manganese and carbon pulverised, filling the porous jar. This jar is put into the glass jar containing a solution of salammoniac; within the same glass jar and solution is a prism of amalgamated zinc, forming the negative pole. Its action is thus: On closing the circuit the salammoniac is decomposed, the chlorine of the solution is absorbed by the zinc, the negative pole; while the hydrogen and the ammonia pass to the positive pole, reducing the peroxide of manganese. According to the inventor's explanation, 'the peroxide of manganese mixed with carbon being a good conductor of electricity, the system may be considered as a single fluid element, in which the positive pole is formed of an artificial metal having a great affinity for hydrogen.'"

Transparency of Galena.—L. HENRY.—In the *Ber. d. Deutsch. Chem. Ges.*, we meet with a communication of some interest upon the above-mentioned subject. The author first gives a general review of the state of our knowledge concerning the transparency of various metals in thin laminæ, and then mentions the discovery, by him, of the same property in thin layers of Galena. The light transmitted is, according to him, of a brownish-yellow color. Several other minerals of similar chemical composition, the sulphides of Arsenic and of Mercury (auripigment and cinnabar) had been known to possess this property, but neither of the minerals named possess metallic lustre, so that to the eye there is nothing to betray their metallic character. With Galena, however, the case is different, its lustre is characteristically metallic, and is one of its distinguishing properties. The commonly accepted association in the mind of the mineralogist, of the two properties of opacity and metallic lustre in descriptive determinations, may, as appearances seem to indicate, have to suffer some restriction in the light of future investigations in this direction.

Gigantic Fossil.—About one hundred miles to the southeast of Hamilton, Nevada, is a high plateau of land containing an extensive deposit of marine shells and the fossil remains of a large variety of extinct species of fish. But the curiosity which most challenges the interest and investigation of geologists is the petrified form of what was evidently once an immense sea-monster. It lies on the high plateau in a position giving rise to the theory that its locale was once a great shoal, and that the antediluvian leviathan floundered and perished on its surface as the water receded. The petrifaction is perfect, and is estimated to weigh about ten tons. It presents a dual appearance—the head and body that of a humpback whale, and the extremities extend into feelers and antennæ like the polypus or devil-fish, with the exception that they were evidently during life lined with a hard and bony substance. The eyes are set in each side of the head, which is flat and oblong, and are twenty-four inches apart. The mouth is armed with triple rows of teeth, sharp in front, but underneath and well into the jaw they turn into grinders, capped by a solid osseous formation, running back from the widest portion of the head. In this respect it resembles the celebrated marsh cow of Central America, amphibious in habit—gramniverous on land and carniverous in water.—*White Pine News.*

MISCELLANEA.

Suez Canal.—In the month of May forty vessels passed through the Suez canal, and the receipts were 486,962 francs, or $89,195. In April the number of vessels was thirty-five, and in March fifty-three. The total receipts from the opening to the end of May were 2,427,499 francs, or $486,500.

Interesting Railroad Statistics.—In 1861 the capacity of all the railroads in the United States was 5,000,000 tons, their value $750,000,000, and earnings for the year from freights $20,102,104. The earnings last year was $300,000,000, and the annual increase in tonnage 96,222,222 tons, valued at $600,000,000.

Commodore Fisk's Freight Car.—JAMES FISK, Jr.'s, freight car, with wheels made so as to conform to any guage, ran through from New York to San Francisco in 14½ days. Everything seemed to work smoothly. We presume that the one thousand cars that Erie was to build, if everything was successful, will shortly be put under way.

Laying Timber and Stone.—The timber of which wooden pavements are made is placed on the end of the grain, as it will wear a much longer period than if the blocks were laid with the side of the grain up. So with building stone. Every piece should be so quarried and dressed out that the edge of the grain may receive the wear of the elements.

Peat.—According to the Marquette *Mining Journal* the peat works there are still in active operation, and the fuel manufactured is coming into general use at Ishpeming. It is now being used with success at the Superior foundry, and, says the *Journal*, "we shall be very much disappointed if its utility in the blast furnace is not demonstrated to a certainty, before the close of the season."

Rails in Russia.—A "Russian Industrial Congress" has been occupied with the question of the practicability of developing the manufacture of rails in Russia. The congress adopted a resolution expressing its opinion that energetic measures should be adopted to establish the manufacture at the three following points of the empire—the basin at the Donets, in the Oural, and at Dombrou, in the kingdom of Poland.

Cork on Locomotive Cylinders.—Cork is such a poor conductor of heat that it is largely employed about steam engines to prevent the cooling of cylinders, and the consequent larger consumption of fuel. According to careful experiments, the economy in fuel amounts to $2 for every 32 square meters of surface protected. Experiments conducted by M. STEUBEL, of Berlin, with locomotives, gave also entirely satisfactory results.

Modified Form of Stone Pavement.—Some little alteration has been made in the usual practice of paving streets in London. The portion of Fleet street which has just been repaved has been done in the following manner: The paving stones were laid with strips of wood or hoop-iron between each row of stones, to keep the rows apart. As soon as a sufficient number of rows were laid, the wood or iron strips were removed, and the spaces partly filled up with clean gravel. After this the remaining space was filled with melted asphalt.

Economizing Fuel.—A patent device for economizing fuel has been put into the Lewiston mills. It consists of a hopper and a mill for grinding coals, reducing the fuel to fine dust, which is carried by the blower into the furnace with air enough to produce immediate combustion. The coal dust leaps into flame like a flake of powder. It is claimed that this device saves 33 per cent. of the expense of making steam. It is said that steam can be generated in one-half the time required by the ordinary use of fuel.

A Great Canadian Canal.—A proposal has been made for the construction of a ship canal of large dimensions between the Indian village of Caughnawaga, opposite the mouth of the Ottawa river on the St. Lawrence, on the outlet of Lake Champlain at St. Johns. The canal is proposed to be 150 feet in width at the top, and 10 feet 6 inches in depth, with locks 300 feet in length by 46 feet in breadth. The total cost is estimated at $2,474,729. The canal, if carried out, will be 50 miles in length. The project includes the widening of the Welland canal also, so as to allow the passage of vessels of 850 tons from Chicago to Burlington. The whole distance from Chicago to Burlington by the proposed route would be 1,484 miles; from Burlington to Boston, 243 miles. By the projected improvements it is expected that freights can be moved at the average rate of 8 miles per hour, while on the Erie canal the rate is but 2 miles per hour. The estimated cost of the entire necessary improvements between Lake Champlain and Chicago is $7,000,000.

Tunnelling the Ohio.—The New Albany *Ledger* broaches the tunnelling of the Ohio in the following language: "A gentleman who has for many years been engaged in the cement business, at Tarascon's mills, on the Kentucky side of the river, near the foot of the falls, has some time been maturing a feasible plan for tunnelling the Ohio river at the falls. He says that the cement bed that crops out on both sides of the river, at the falls, extends entirely across the river, and the strata is of an average thickness of from sixteen to twenty feet. This cement rock is of such value, and in such demand, that the gentleman thinks that if a tunnel was cut through it, the rock coming from the tunnel, manufactured into cement, would pay the entire expense of the work. He says it would also give the tunnel an indestructable shield, that would bear all the weight of the water above that could possible press upon it, and is sanguine that capitalists will yet take hold of the project and build the tunnel. He says the strata of cement rock runs under Sand Island, and no doubt extends to New Albany.

Application of Steam to Military Purposes.—One of the road steamers was employed in an experiment which was made a few days ago at the Easter road barracks by the Edinburgh Militia Artillery, and which is noteworthy as probably the first time that heavy guns of position have been handled with ease and rapidity without horses, bullocks or elephants. By means of the engine two guns of 50 cwt. were moved at six miles an hour, and wheeled while moving at that rate in a space of eight yards in breath. They were placed in position with a precision and rapidity that could scarcely be attained by any other means with guns of equal weight. This, it may be remarked, is the first time that THOMPSON'S road steamers have been actually applied to heavy artillery. It is extremely probable that they will be largely used in future in military operations. A number of them are being made for the British and Indian Governments, and they will not unlikely in future be in constant use by all civilized armies. The experiment referred to will, therefore, be quoted in future as the commencement of a new and important application of steam to warlike purposes. The value of the appliance can be judged when it is stated that these heavy guns could be brought into action at Dalkeith, which is six miles from Edinburgh, within an hour and a half after the order was received to march from Edinburgh.—*Engineer.*

MARKET REVIEW.

The Coal Trade.

NEW YORK, August 12, 1870.

We find the market this week very quiet. The coal that comes to tide water is very readily taken, and no stock accumulates. Prices are firm, though for occasional lots a shade below circular rates may be taken. The effect of the shipments from Schuylkill is to make coal rather more plenty, which is extremely fortunate in the face of the increasing demand. We understand that the Old Company's men went to work on the 10th.

The Press, daily and weekly, moved by the resumption in Schuylkill, have taken upon themselves the task of commenting upon the coal trade, giving advice to miners, railing at all the trade, and displaying what knowledge they are able to muster upon the subject. The amount of knowledge, however, seems exceedingly small, and the general aim seems to be rather to please the reader than to make fair statements of the facts involved. The United States *Mining Register* makes the following comments upon the strike and its result: "This week will be memorable for the defeat of both parties to the great wages contest in the Anthracite coal region. Hunger has conquered the miner; poverty the operator. Both have yielded; and both have helped to lay the basis of future unhappiness.

"All the operator gets is a barren permission to discharge his hands for 'incompetency, bad workmanship, bad conduct, or other good cause,' provided it be not for his obedience to the laws of the Miners' Union.

"All that the miner gets is a bare permission to go to work *softly*, under promise not to 'overwork hisself,' never to permit his enthusiasm for wife or child or a personal competency to run away with him, never to earn more than $100 a month. The miners get their basis of last year, for which they have fought so hard, but it turns to a Sodom-apple in their mouth. And the worst of it is, that they are not defrauded by their supposed natural enemies, the operators, but by their supposed natural guardians, the Council of their Order."

The Boston *Daily Advertiser* says a few words about the result of the contest, and prophesies as follows: "The result of such contests as this may be readily foreseen. Indeed, it is already beginning to manifest itself. The smaller operators cannot work at such a disadvantage. They will be swept out of the business, and the whole coal trade will concentrate itself in the hands of a few large companies, which will monopolize the market. At present there is sufficient competition to keep down the prices. The gigantic companies which are even now slowly coming into existence will be able to control both the trade and the miners. They will limit the production, and will fix the wages of persons employed in the collieries. There will be no small concerns to yield to the demands of the workmen, and bring a strike to an end; but with abundance of capital, and with the firmness which confidence in final success brings, they will hold out and crush the association, if they do not end by oppressing the workmen who now place their dependence upon it."

The New York *Daily Bulletin* thus elucidates its opinions about matters and things relating to the trade: "The anthracite trade is a monopoly controlled by a few large corporations which own the routes by which coal is transported to market, as well as the principal sources from which it is obtained, and are thus enabled to regulate its market value by increasing or diminishing the supply, as shall most conduce to their immediate interest. The processes by which the market is manipulated are watched by the miners, who presently demand that, as their interests as laborers are made subservient to the interests of their employers as speculators, they shall share the profits of the operations which fix the price of coal at a point far above its actual value to the producers. This demand is, of course, refused, and a strike is declared in consequence of such refusal. As long as the operators have a supply on hand equal to the probable demand for a given period, it makes but little difference to them whether the men work or not, as any damage to the idle machinery of the shafts is more than compensated by the enhanced value of the stock on hand, and the saving of wages, which must otherwise be paid. Should the miners decline to strike at the proper time, the operators would agree upon a suspension until such time as it suited their convenience to resume; but if a strike is ordered, the operators allow it to continue as long as it is profitable to them, and then make such concessions as may be necessary."

It then goes on to state what *its* ideas are upon the proper mode of remedying all the evils attendent upon the Anthracite trade. It says: "For these evils we know of but one practicable remedy. Congress must repeal the duty on imported coals, and thus permit their introduction to the American market in competition with the domestic product."

Our friends in the trade can draw their own conclusions. We would merely hint that we do not quite agree with the above, inasmuch as we can't quite see where the coal is to come from which shall to any great extent reduce the price of Anthracite. The *Evening Post* makes the following remarks about the wholesale dealers: "Wholesale dealers say that they would prefer to have low prices prevail, for the demand is not only better, but the risk is not so great—retail dealers being able to dispose of their stocks rapidly. They assert that they have sold coal at a loss during this season, being compelled to do so in order to keep up their contracts and work off the stock on hand. In illustration they cite instances where coal has been sold at $5 per ton, wholesale, here, on which nearly $3 was paid as freight from the mines."

It then comments as follows upon "the future": "With respect to future prices the opinion is expressed by coal operators and dealers here that there cannot be much reduction from the present rates, if any, and the probability is that there will be a slight advance. It is estimated that even the increase of one million tons in the production will not much more than serve to supply the natural increase in consumption. There will be no scarcity of coal, but the supply will be just about equal to the demand, and perhaps a little in advance," which we take to be about as wholesome a statement as one need to have at the present time.

The Philadelphia *Telegraph* of the 6th thinks that the terms agreed upon "cannot be a spontaneous" offer of the men. It thinks the proper course for the men is this: "If anything does not suit the miners, if wages go below a living rate, let them stop work individually or collectively, but not strike in the trade union sense, or leave the trade for more profitable employment until a sufficient number only remain to produce a higher rate. By such a course of action they would be regarded as honorable men, and their demands would in all probability be complied with." It then takes up trade unions: "But let us have no more of workingmen's unions, with regulations for forcing any price, unjust or otherwise, upon the market; no more organized strikes for fancied or trivial wrongs, which always result to the injury of the strikers in the end."

The strike of the Lehigh miners against the Lehigh Coal and Navigation Company, is treated as follows by the same paper: "The strike of the Lehigh miners against the Lehigh Coal and Navigation Company, has been concluded by one of the most signal failures to be found anywhere in the history of mining. The men have not gained one single point by their long season of idleness, and have been compelled to resume work on exactly the same terms which were offered to them by the company in the first place. This, though not very satisfactory to the Lehigh men, will teach them a lesson. But the most beneficial results will flow from the example set the Schuylkill men, who, without the dissatisfied feelings of those in Lehigh, which may result in another strike of some sort before very long, will feel more forcibly the great risk of success attending such movements, and the great loss on all sides which always accompanies them."

The New York *Herald* thinks that, as "coal at places of shipment has been reduced to $2 25 per ton," we should not be compelled to pay over $5 or $5 50 per ton for it until navigation closes. This will no doubt be very pleasing to consumers. But how about those who have freights, tolls, and all the other etceteras to pay? We think they will hardly be able to see it in that light.

ITEMS.

A Western paper notices the fact that there is a coal mine at Fort Dodge three feet thick in the thinnest place, and eleven feet through in the thickest place. Its area is represented as so wide that generations will not exhaust it, and it is reported the hardest bituminous coal yet discovered west of Pittsburg. This, if true, to the extent stated, is the one thing wanting to develop the great West rapidly and in all the fullness of its wealth.

WE are indebted to Mr. JOSEPH S. SILLYMAN, of Pottsville, Pa., for a copy of Messrs. STRAUCH & COCHRAN'S new lithographic map of the first and second Anthracite Coal Fields of Pennsylvania.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending August 13, 1870, compared with week ending August 14, 1869.

COMPANIES.	1869. WEEK.	1869. *TOTAL.	1870. WEEK.	1870. TOTAL.
*Phila. & Reading R.R.	111,492	1,940,337	67,880	1,314,751
Schuylkill Canal	32,817	385,336	8,763	72,957
Lehigh Valley R. R.	68,073	1,319,207	56,564	1,894,389
Lehigh & Sus. R. R.	19,638	430,614	16,394	572,671
Lehigh Canal	28,582	343,745	20,441	328,063
Scranton North	55	207,662	16,734	425,379
" South	3,666	613,568	30,246	1,054,919
Penn. Coal Co., rail	17,910	539,758	24,[illegible]	675,238
" " " canal	477	9,518	[illegible]	10,515
Del. & Hud. Canal Co.	18,638	631,809	47,3[illegible]	840,646
" " R. R.	1,800	101,[illegible]45	7,1[illegible]	276,778
" " south		51,174	12,51[illegible]	79,394
Shamokin	13,168	214,037	8,998	235,142
Trevorton		11,091	2,717	47,832
Lykens Valley Coal Co.	1,957	39,674	4,160	68,029
Wyoming South	19,414	131,856		
Wyoming North				
P. N. Y. C. & R. R. Co.			4,456	178,995
Williamstown, Coal'y.	6,746	102,928	6,732	171,491
Short Mountain	3,194	59,719		
Total	344,948	7,153,569	342,043	8,468,730
1869	342,043			7,153,596
Increase week and year	2,905			1,315,203

* Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Aug. 6, 1870, compared with week ending August 7. 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.	23,000	560,000	17,768	555,366
C. & O. Canal	17,000	324,000	13,845	346,056
H. & B. T. R. R.	....	204,324	....	179,848
Harrisburg & D.	14,930	....	17,755	468,591
L. V. R. R.	....	552	....	9,380
P. & N.Y. C. & R. Co.	....	....	5,721	145,453
	....	....	....	....

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending Aug. 4, 1870—less coal carried for Company's use, and Bituminous Coal:

For week	67,880 14
Previously this year	1,246,870 19
Total	1,314,751 13
Same time last year	1,940,337 06
Decrease	625,585 13
Amount sent same week 1869	111,492 18

Report of coal transported over the Schuylkill Canal for the week ending Thursday, August 4, 1870.

	Tons. Cwt.
From Port Carbon	— —
" Pottsville	— —
" Schuylkill Haven	8,589 02
" Port Clinton	174 00
Total for week	8,763 02
Previously this year	64,193 18
Total	72,957 00
To same time last year	385,336 08

Amount of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, August 4, 1870:

From St. Clair	23,681 09
" Port Carbon	4,414 15
" Pottsville	2,420 15
" Schuylkill Haven	24,060 12
" Auburn	2,961 01
" Norristown	— —
" Port Clinton	7,625 09
" Allentown and Alburtis	2,716 13
" Harrisburgh and Dauphin	17,755 03
Total paying freight	85,635 17
Coal for Company's use	2,790 04
Total for week	88,426 01
Previously this year	1,715,814 16
Total	1,804,240 17
To same time last year	2,286,722 19

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, Aug. 8, 1870.

	WEEK.	SEASON.
North	39,987 13	1,346,542 08
South	12 538 13	270,953 14
Total	52,526 06	1,617,496 02
Corresponding time in 1869.		
North	2,285 13	717,574 19
South		49,457 04
Total	2,285 13	767,032 03
Increase North	37,702 00	Increase 628,967 09
Increase South	12,538 13	Increase 221,496 10
Total Increase	50,240 13	Increase 850,463 19

Report of Coal Transported over Lehigh Valley Railroad

For the week ending August 6, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREV'LY. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	7,522 04	400,575 01	408,097 05
" Hazleton	47,141 04	1,257,917 11	1,305,058 15
" Upper Lehigh	629 13	8,078 06	8,707 19
" Beaver Meadow	15,954 15	452,575 17	468,530 12
" Mahanoy	7,137 18	142,277 00	149,444 18
" Mauch Chunk		447 17	447 17
Total Anthracite	78,415 14	2,261,871 12	2,340,287 06
Bituminous Coal recv'd from Cata. R. R.			
N. C. R. R.			
E. P. R. R.		9,380 00	9,380 00
P. & N.Y. C. & R.R. Co			
Fall Creek			
Schroeder			
Towanda			
Total by rail and canal	78,415 14	2,271,251 12	2,349,667 06
Same time last year	80,596 19	1,435,535 00	1,516,131 19
Increase		835,716 12	833,535 07
Decrease	2,181 05		
Forwarded East from M'h Chunk by rail	56,564 16	1,827,825 02	1,884,389 18
Same time last year	65,073 07	1,254 134 09	1,319,207 16
Increase		573,690 13	565,182 02
Decrease	8,508 11		

RECAPITULATION.

Forwarded East from M'h Chunk by rail	56,564 16	1,827,825 02	1,884,389 18
To N. C. R. R., at Mount Carmel	308 00	370 07	678 07
Forwarded North from L. & B. Junction	4,431 04	174,094 15	178,523 19
To L. & S. R. R. at Packerton for rail	173 04	4,873 17	5,047 01
Delivered at M'h Chunk	32 10	770 06	802 16
Delivered on line of road above Mauch Chunk	45 00	7,568 07	7,613 07
Delivered above M. Chunk for use of L. V. R.R.	1,070 10	33,958 05	35,028 15
To L. & S. R.R., at P'n Hav., for railroad	10,307 16	142,037 08	152,345 04
Do. for canal	5,482 14	70,575 05	75,857 19
At M.Chunk for canal			
Total Anthracite	78,415 14	2,261,871 12	2,340,287 06
Bituminous Coal		9,380 00	9,380 00
Total all kinds	78,415 14	2,271,251 12	2,349,667 06

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending August 6, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons cwt.	WEEK, 1869. tons cwt.	YEAR 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	27695 02	22202 03	695513 00	406310 13
Upper Lehigh Region	3967 14	3580 17	83501 18	73113 16
Mahanoy Region	91 14	192 06	887 08	1626 01
Hazleton Region	10718 05	9484 19	158313 16	94639 13
Beaver Meadow Region	5391 00	4898 02	75857 02	53832 11
Mauch Chunk Region	619 12	8843 19	32059 17	18224 11
Totals	48483 07	49075 08	1045632 18	812347 05
Increase			232285 13	
Decrease	592 01			
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	16396 14	19636 01	572671 07	430614 10
Forwarded East of Mch Chunk by Canal	26141 15	28882 06	328063 02	343745 18
Delivered at and above Mauch Chunk	1017 10	557 01	24651 19	19147 08
Delivered to L. & B. R. R.at PlymouthBridge	4827 08		120246 16	13698 03
L. V. R. R. at Sugar N.				5151 03
Totals	48483 00	49075 08	1045632 18	812347 05
Of the above there was transported on acc'nt of L. C. & N. Co.	619 12	10048 05	48713 14	201549 16
W.-B. C. & I. Co.	12298 15	12378 04	312201 03	216553 06
Totals	12918 07	22426 09	360914 17	418103 16
Increase				
Decrease	9508 02		57128 05	

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending August 4, 1870:

	Tons.
For week	17,755 02
Previously this year	450,836 07
Total,	468,591 10
Same week last year	14,930 08

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending August 10, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	4,456 04	174,539 07	178,995 11
Bituminous	5,721 00	139,732 00	145,453 00
Total, Ant. and Bit.	10,177 04	314,271 07	324,448 11

Shipments of Cumberland Coal

for the week ending Saturday, August 6, and for the year 1870:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M.	.....	.....	.....
Borden	559 01	2,020 11	2,579 12
Consolidation	2,468 04	3,743 00	6,211 04
Spruce Hill	650 11	.....	650 11
Midlothian	797 14	682 06	1,480 00
H. and Baltimore	9 10	277 14	287 04
do Va M	616 11	.....	616 16
V C & I Co	588 16	.....	588 11
G. C. C. and I.	896 00	.....	896 00
Maryland	316 11	2,797 10	3,114 01
American	.....	4,324 07	4,324 07
Atlantic	1,557 15	.....	1,557 15
Piedmont	1,222 00	.....	1,222 00
Swanton	1,064 15	.....	1,064 15
Barton	822 00	.....	822 00
Potomac	1,818 13	.....	1,818 13
Franklin	1,877 01	.....	1,877 01
Big Vein	2,503 13	.....	2,503 13
Total week	17,768 15	13 845 08	31 614 03
Previous	557,597 17	332,211 09	869,809 06
Total year	555,366 12	346,056 17	901,423 09

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, Aug 6, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	TOTAL. Tons. Cwt.
1870	11,935 19	14,233 11	26,169 10
1869	17,906 10	23,777 08	41,683 18
Increase			
Decrease	5,970 11	9 543 17	15,514 08

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	295,366 05	489,578 17	784,945 02
1869	323,964 16	569,705 14	893 670 10
Increase			
Decrease	28,598 11	80,126 17	108,725 08

Statement of coal transported over the Eckhart Branch Railroad, during the week ending Saturday. Aug. 6, 1870, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	TOTAL. Tons. Cwt.
1870	1,909 09	2,329 17	4,239 06
1869	1,746 05	3,253 08	4,9 9 13
Increase	163 04		
Decrease		923 11	76) 07

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	55,274 01	59,718 12	114.992 13
1869	38,969 02	60,471 15	99,440 17
Increase	16,304 19		15,551 16
Decrease		753 03	

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

SCHUYLKILL.	AT NEW YORK, August 11. R. A.	W. A.	AT PHILADELPHIA, August 12. R. A.	W. A.
Lump	$- —	$5 00	5 00	4 50
Steamer	- —	5 00	- —	4 50
Broken	- —	5 25	- —	4 50 to - —
Egg	5 75 to 6 25	5 25	- —	4 75 to - —
Stove	- —to - —	5 75	- —	4 75 to - —
Chestnut	4 50 to 5 40	4 75	- —	4 25 to - —
Pea	- —	- —	- —	- —
LEHIGH.				
Lump, (along side)	6 00	- —	- —	- —
Broken	5 75	- —	- —	- —
Egg	5 60	- —	- —	- —
Stove	6 00	- —	- —	- —
Chestnut	5 25	- —	- —	- —
Pea	- —	- —	- —	- —
SPECIAL COALS.*				
Diamond Vein	R. A.	- —	- —	- —
New England	"	- —	- —	- —
Locust Dale	W. A.	- —	- —	- —
Honey Brook, Le'h	W. A.	5 25 to 6 00	- —	- —
Spring Mountain	"	5 25 to 6 00	- —	- —
Sugar Creek	"	5 25 to 6 00	- —	- —
Sugar Loaf	"	5 25 to 6 00	- —	- —
Old Comp'y's.	"	5 25 to 6 00	- —	- —
Cross Creek	"	25 to 6 00	- —	- —
Enterprise	"	- —	- —	4 75
Girardville	"	- —	- —	4 75
McMichael	"	- —	- —	- —
Shamokin	"	5 50	5 25	- —
Lykens Valley	"	- —	5 25	- —
Broad Top	"	5 50	- —	- —
Hill & Harris.	"	- —	4 75	- —
Henry Clay	"	- —	5 00	- —
Powelton	"	5 50	5 00	- —

[*Dealers in these coals may be found in our advertising columns.]

Prices for Coal at Mauch Chunk.

	F. L.	Bro.	Gra.	Eg.	Sto.	Cst.
Lehigh	$3 00	$3 75	$3 75	$3 75	$4 00	$3 25
Wilkesbarre	3 00	3 75	3 75	3 75	4 00	3 25

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein f.o.b. at Phila	$5 00
Lemon " " "	4 75
Cumberland Vein Coal	5 00
Cumberland C. & I. Co.'s on board N. Y.	7 00
Maryland Coal Co. " "	7 00
Consolidated Coal Co.'s " "	7 00

Company Coals.

	L.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	4 30	4 50	4 50	4 60	5 10	4 20
Pittston at Newburgh	4 60	4 70	4 80	5 00	5 25	4 60
Lackawana at Rondout	4 60	4 70	4 80	5 00	5 25	4 60
*Wilk'b're at Hoboken	5 00	5 25	5 50	5 50	6 00	5 00
Old Co. Lehigh at Pt. Johnston	- —	- —	- —	- —	- —	- —
Lehigh at E. Port	5 75	5 50	5 50	5 50	5 75	5 00

For freights to different points, see "Freights."

* 25c. advance alongside.

Prices at Baltimore—August, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 30@5 50
Pittston and Plymouth, do	5 00@5 25
Shamokin Red or White Ash, do	5 50@6 00
Lykens Valley Red Ash, do	5 40@5 50
Zerba Valley	25 50-
By retail, all kinds per ton of 2240 lbs.	7 00@7 50
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 75@5 00
Fairmont and Clarksburg gas, f. o. b. at L. Point	5 35@5 50

Prices at Georget'n, D.C., & Alexandria, Va.

August, 1870.

George's Creek and Cumberland f. o. b. for shipping..$4 55

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$- —@- —
Lykens Valley	- —@- —
Shamokin Red or White Ash	- —@- —
Trevorton and Zerba Valley	- —@- —

Prices of Gas Coals.

August, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 73 Pine st., N.Y.

	Duty, $1 25, gold.	Coarse.	Slack.
Block House	$1 75	@- 75	
Gowrie	1 75	@- 75	

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	@1 25
Sydney	2 25	@- 80
Lingan	1 75	@- 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Coarse.	Slack Currency.
Fairmount Gas Coal Co. of N. Y.	7 50	@— —
Despard Coal Co	$7 50	@— —
Penn	— —	@— —
Newburg Orrel Gas	— —	@— —
West Fairmount Gas Coal	8 00	@— —

AT PHILADELPHIA.

Powelton $7 80

Prices of Foreign Coals.

August, 1870.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	10 00@12 00
" House	13 50@15 50
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon $2 00
Less drawback of 80 cents on all Coal shipped east of New Brunswick and south of Cape Henry.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 84
C. R. R., N. J., Easton to Elizabethport	1 27
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 46

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R. or L. & S. R. R. from M. C. to Easton	$ 84
C. R. R., of N. J., Easton to Pt. Johnson	1 34
Shipping expenses	25
Warfage	10
Total	$2 53

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 84
Morris & Essex R. R. Easton to Hoboken	1 34
Shipping expenses	25
Warfage	10
Total	$2 53

TO SOUTH AMBOY.

L. V. R. R.	84
B. & D. R. R.	1 14
Cam. & Am. R. R.	
Shipping Expenses,	25
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	84
C. RR. of N. J. Easton to Elizabethport	1 27
Shipping expenses	25
Wharfage	10
Total	$2 46

BY CANAL.

Via Schuylkill Canal.

TO PHILADELPHIA.

From Schuylkill Haven	$1 07
" Port Carbon	1 10
" Port Clinton	1 00

TO NEW YORK.

From Schuylkill Haven	$1 70

Via Lehigh Canal.

TO PHILADELPHIA.

Lehigh Canal	$0 70
Freight and towage	1 07
Total	$1 77

TO NEW YORK.

Lehigh Canal	$ 40
Morris "	1 10
Freight, Towing	
Total	$ 2,50

TO JERSEY CITY.

Lehigh Canal	$ 40
Morris "	2
Freight	
	2 40
For re-shipment	2 20
Total	$4 60

Via Delaware and Raritan Canal.

TO NEW YORK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	25
Freight	1.25
Towage	20
Total	$ 2,50

TO NEW BRUNSWICK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1.05
Total	$ 2,10

For Re-shipment—30 extra for shipping, and 10 cents. drawback.

TO BOSTON.

Sydney	$—
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

Freights.—AUGUST, 1870.

TO EASTERN PORTS.	From Philada.	From E. Port and Port Johnson	From Newbury	From Rondout
Amesbury	$2 50	$— —	$	$
Bangor	2 75	— —	1 60	
Bath	2 25	2 00	— —	
Boston	2 20	1 60	2 00	1 75
Bridgeport	1 60	1 00	1 10	1 20
Bristol	2 00	1 25	1 40	
Cambridgeport	2 50	2 00		
Derby	2 00	— —		
Dighton	1 85	— —	1 45	
East Cambridge	2 50	2 00		
Fall River	1 75	1 25	1 40	
Hackensack	1 95	1 50		
Hartford	2 75	1 35		
Jersey City	1 75	80		
Middletown	— —	1 25		
Mystic	1 75	1 25	1 30	
New Bedford	1 75	1 40		
Newburyport	2 20	2 00		
New Haven	1 70	1 00	1 10	1 20
New London	2 00	1 15	1 25	1 30
Newport	1 75	1 25	1 40	
New York	1 25	50	70	
Norwalk	1 80	1 00	1 05	
Norwich and tow	1 70	1 35	1 35	1 40
Fawtucket	1 90	1 50	1 60	
Portland	2 00	1 75		
Portsmouth, N. H.	2 15	2 25		1 85
Providence	1 85	1 40	1 45	1 45
Rockport	2 10	— —		
Saco	2 30	2 10		
Sag Harbor	2 00	1 40	1 30	
Salem	2 10	1 60		1 75
Stamford	2 00	1 00	1 00	
Stonington	2 00	1 30	1 25	
Taunton	2 75	2 00	—	
Warren	— —	1 40	1 45	
Washington	1 10			
TO RIVER PORTS.				
Albany		$90	- 60	
Catskill		— —	- 50	
Cockeackie		— —	- 50	
Coeyman's		— —	- 75	
Cold Spring		— —	- 35	
Fishkill		— —	- 30	
Haverstraw		50	- 60	
Hudson		— —	- 50	
New York		— —	- 70	
Nyack		50	- 60	
Poughkeepsie		— —	- 35	
Rhinebeck		— —	- 30	
Rondout		— —	- —	
Saugerties		— —	- 40	
Sing Sing		— —	- 75	
Stuyvesant		— —	- 55	
Tarrytown		80	- 75	
Troy		90	- 75	
West Point		— —	- 35	
Yonkers		40	- 60	

Towing Rates.

TO EASTERN PORTS.

	Per Ton.
To New Haven	$ 40
Bridgeport	40
Southport	40
Westport	40
Norwalk	40
Stamford	40
	Per Boat.
Greenwich	$70 00
Port Chester	80 00
Mamaroneck	70 00
Glen Cove	40
New Rochelle	55 00
East Chester	60 00
West Chester	30 00
White Stone	30 00
College Point	25 00
West Farms	25 00
Flushing	30 00
Harlem and Mott Haven	20 00
Port Morris	20 00
Ninety-first street and Astoria	16 00

Boats beyond Port Chester, with less than 200 tons, $80 per Boat.

TO RIVER PORTS.

Boats of 150—250 Tons.	Per Ton.
To Manhattanville	8 cents
Spuyten Duyvil	8 "
Yonkers	9 "
Hastings	10 "
Piermont	10 "
Dobbs' Ferry	12 "
Nyack	14 "
Tarrytown	15 "
Sing Sing	16 "
Croton Landing	17 "
Haverstraw	17 "
Verplanck's	17 "
Peekskill	18 "
West Point	20 "
Cold Spring	20 "
Newburgh	18 "
Poughkeepsie	22 "
Rondout	23 "
Boats of 100 Tons	*Per Boat.*
To Manhattanville, and Return	$11 00
Spuyten Duvvil, "	13 00
Yonkers, "	15 00
Sing Sing, "	20 00
Peekskill, "	25 00

Foreign and Provincial Freights.

August, 1870.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 1-5 tons	£14 00@£16 00
Liverpool	12s.6d@14.ton

TO NEW YORK.

Provincial	
Sidney	$—
Lingan	—
Cow Bay	—
Port Caledonia	—
Little Glace Bay	—

METALS.

NEW YORK, August 12, 1870.

IRON.—Duty: Bars, 1 to 1½ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1½ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

	Store Prices.
Pig, Scotch No. 1, ₱ ton	33 50@37 00
Pig, American, No. 1	32 00@33 —
Pig, American, No. 2	30 —@31 —
Pig, American, Forge	29 —@30 —
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@100 00
	Store Prices, Cash
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	— —@110 50
Bar, Refined " "	80 —@ 85 00
Bar, Common " "	75 00@ 80 00
Sheet, " "	97 50@130 —
Ovals and half-round " "	100 —@125 —
Band " "	95 —@ — —
Horse Shoe " "	95 —@ — —
Rods, ⅜ to 3-16 inch " "	85 —@120 —
Hoop " "	105 —@150 —
Nail rod, less 5 ₱ ct.	— 7 @—7½
Sheet, Russia, as to Nos. (gold)	— 11¼@—11¾
Sheet, Single, D. and T. Common	— 5 @— 6
Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13 14 @15 c. off.	
Rails, English (gold), ₱ ton	59 00 @60 00
Rails, American, at Works in Pa	70 00 @71 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ ₱ or under, 2¼ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 2¼ cents ₱ lb, and 10 ₱ cent ad val. (St prices.)

English Cast (2d and 1st quality) ₱ lb	— 15 @— 18
English Spring (2d and 1st quality)	— 7 @— 15
English Blister (2d and 1st quality)	— 10 @— 17
English Machinery	— 11½@— 14
English German (2d and 1st quality)	— 13 @— 15
American Blister "Black Diamond"	— — @— 12
American, Cast, Tool do.	— — @— 18
American, Spring, do.	— 9 @— 11
American Machinery, do.	— — @— 12
American German, do.	— 9 @— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₱ lb	— @— 30
Copper Bolts	— @— 30
Copper Braziers, 16oz. and over	— @— 30
Copper Nails	35 @— 36
Copper, Old Sheathing, &c., clean	— @— 17
Copper, Chili Pig	— @— —
Copper, American Ingot	19¼@— 20¼
Yellow Metal, New Sheating	— @— 22
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 22

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1½ cents ₱ lb; Pipe and Sheet, 2¾ cents ₱ lb.

Galena, ₱ 100 lbs	$— @— —
Spanish (gold)	6 32½@6 45
German, do.	6 37½@6 45
English, do.	6 37½@6 62½
Bar (net)	— —@8 00
Pipe and Sheet (net)	— —@8 00

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	— @37½
Straits	36 @36½
English	— @32

PLATES.

Fair to Good Brands.	*Gold.*	*Currency.*
I. C. Charcoal, ₱ box	$8 75 @9 —	$10 75 @11 —
I. C. Coke	7 50 @8 —	9 25 @ 9 75
Coke Terne	6 — @6 25	7 25 @ 7 50
Charcoal Terne	7 75 @8 —	9 50 @ 9 75

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100 lb

	Gold.
Plates, Foreign, ₱ 100 lbs.	$6 37½@ 6 62½
Plates, Domestic, ₱ lb.	08½@— 11½

REMARKS.

IRON.—The demand for Scotch Pig continues light, but holders are still firm in their views, the market closing steady at former quotations. We have only to notice sales of 200 tons Eglinton, Glengarnock and Gartsherrie, in lots, at $34@35 50, as to brand. American is in moderate request at quoted rates; 1,000 tons Gray Forge, delivered above Easton in the cars, sold at $27. In Wrought Scrap, we note sales of 300 tons on terms not made public. New Rails meet with very little inquiry, and prices are irregular. Old continue in demand, and prices still harden; 800 tons old Double-headed, part to arrive, sold at $40@40 50, gold; and 825 do. T., part for Western delivery, on private terms. Bar fom store is steady, and rather quiet at our quotations. Common Sheets may be quoted at 4¼@6c. for Singles, Doubles, and Trebles. Galvanized Sheet may be quoted 10c. for 14 to 20; 11c. for 22@24; 12c. for 25@26; and 13@14c. for 27@29, all net cash.

TIN.—Pig remains dull, and, though Straits has advanced in London to 126s., there has been no response here. We quote 36¼@36½c., without business. Five tons English sold at 32c., and 25 do. at a private price. Banca nominally 33½c., all gold. Since the considerable business in Plates, noted in our last, the market has been quiet, but prices remain steady and firm. We have only to notice sales of 1,000 bxs. Charcoal Terne, on private terms.

COPPER.—New Sheathing is steady at 30c., and Yellow Metal 22c., cash. Ingot remains dull, though prices are without quotable change. Sales have been made, in lots, of 125,000 lb. Lake and Detroit at 20½@2 ·|c.; and 50,000 lb. Baltimore 20c., cash.

SPELTER.—The advanced prices for Foreign checks business, and since our last we hear of no sales. Silesian is held at 6½@6¾ cents gold. In Domestic, we notice sales of 30 tons American Zinc Works at 8@8½ cents currency.

LEAD.—Foreign Pig remains firm, but, since our last, the market has been quiet, the only business being in contracts for future delivery, direct to manufacturers. Bar, Pipe and Sheet 8 cents net cash.

ZINC.—We note a sale of 50 casks Mosselmann Sheet to arrive at 8½ c. less 4 ₱ c. gold—market for lots from store very firm.

STEEL.—Store prices are unchanged, and business is firm.

Mining Stocks.

NEW YORK, August 12, 1870.

Mining Stocks continue dull, with a slight improvement in the prices of some kinds, and a decline in others. Those that have advanced are: Black Hawk from 20 to 30 c.; Quartz Hill from 20 to 22 c.; and Smith & Parmelee from 50 to 52 c. Those that have declined are: Central from 25 to 23 c.; Consolidated Gregory from 70 to 65 c.; and Grass Valley from 47 to 42. Some holders of these stocks, however, are asking the rates of last week. We quote the Stock Exchange list:

	Bid.	*Asked.*
Bates and Baxter	15	—
Benton Gold	5	10
Black Hawk Gold	30	—
Central Gold	23	25
Consolidated Gregory	65	80
Grass Valley	42	45
Gunnell Gold	15	—
La Crosse Gold	08	—
Liberty	02	03
Mariposa	—	—
Mariposa pfd	—	—
Quartz Hill	22	—
Symond's Forks	—	—
Smith & Parmelee Gold	52	—
Quicksilver	—	—
Quicksilver, pref	—	—
Wa kill	03	—
Walkill ssented	05	12
Rutland Marble	--	—
Lehigh & Susquehanna	1 05	—

Petroleum stocks are stronger, being quoted as follows:

	Bid.	*Asked.*
Bennehoff	—	40
Bergen Coal and Oil	40	—
Bliven Oil	—	—
Blood Farm	—	—
Brewoort	—	—
Buchanan Farm	45	50
Central	50	60
Clinton	—	2 00
Home Petroleum	—	2 05
National	—	—
N. Y. & Alleghany	2 10	2 50
Northern Light	55	—
Pithole Creek	1 05	1 40
Phillips	15	25
Rathbone	—	40
Rynd Farm	28	32
Second National	—	75
Tar Farm	—	—
United Petroleum Farms	15	20
United States	—	80

San Francisco Stock Market.

We have the following list of quotations by telegraph from San Francisco, bearing date August 11. The list is stronger. Attention is directed to the comparative statement of the production of the Comstock mines, given in another column.

Savage	35½	Gould & Curry	49
Yellow Jacket	34	Belcher	No sales.
Kentucky	53	Imperial	No sales.
Chollar Potosi	42½	Amador	197½

Yacht Excursion.

OUR friends of the Coal trade are much given to pleasant excursions, with all the agreeable accompaniments. One of these took place on Monday, the 8th. By invitation of Captain DAVID COX, of the steamer "Tontine," a large party of gentlemen connected with the Coal trade went on an excursion down the bay, to witness the great international yacht race. The day was all that could have been desired. When we reached the line where the yachts were anchored, we passed along its whole length, giving a chance to inspect each vessel. As they were moored heading up the bay, we could see them at the greatest advantage. Of all the yachts there, not excepting the "Magic," none had a more beautiful bow than the old "America." The knowing ones on board thought with the rig she had in 1851, she would be first or second in the race. Her masts have been shortened six feet, and her main boom twelve feet, since the Government has had her.

Of the start, every one knows even of the smallest details, and of the race up to the time of leaving South-west Spit for the light-ship. Just after rounding the buoy at the Spit, came the contest between the four leading yachts; the "Magic" so far ahead, we almost doubted whether she was in the race; then came the "Idler," and then the "America," and following her, the "Dauntless."

Being directly to windward, we had the best possible chance of seeing the performances of the boats. For some time there was no change in their position, when suddenly the "America" seemed to loose her headway, and in a few minutes changed places with the "Dauntless." Then came a thrice-repeated attempt to hoist a stay-sail, which, after her headway had been seriously impeded, was given up. It can scarcely be doubted that, had the "America" had all the canvas she needed, she would have beaten the "Idler," and possibly the "Dauntless." At this time the "Cambria" was on the same tack, but very far astern, and, it seemed, a couple of miles or more to leeward.

As soon as the three leading yachts had rounded the light-ship we started for the stakeboat, as fast as one engine could drive us. Before the wind the value of the light canvas began to tell, and the "Dauntless" began to slowly overhaul the "Magic," after having passed the "Idler." We were just near enough to see the two leading yachts pass the stake-boat, arriving just a moment before the "Idler."

Then came the pleasant sail home. Among our party were Mr. FRED. POTTS, Mr. JOHN ANDREWS, J. S. GRIFFITHS, J. C. CRANE, FRANK CANN, G. W. and W. B. TUTHILL, GEO. BLACK, CHAS. and FRANK GULAGER, A. R. BASS, CHRISTOPHER WRIGHT, LU. STOUT, G. COMSTOCK, and several other gentlemen, whose names we do not now recall.

The Slate Trade.

NEW YORK, Aug. 12, 1870.

We take the following in relation to the slate trade from the *Protectionist:*

"An animated discussion took place in the Senate, a few days ago, in which the Kansas Senator, Mr. Pomeroy, true to his free trade instincts, made an attack upon the slate interest of the country by endeavoring to secure the reduction of the duty from the present rate of thirty-five per cent. ad valorem to twenty per cent. ad valorem.

"In his attempt he was supported by Senator THURMAN, of Ohio, who sought to secure the introduction of Canadian slate in competition with our Pennsylvania quarries and those of Vermont. The Senators from Vermont successfully opposed the reduction. The discussion proved the general interest felt in slate throughout the West, and the anxiety of the prairie communities to secure an abundant supply of this desirable and safe roofing material. It also disclosed the entire ignorance of the honorable Senators regarding a vast deposit of this mineral which is about being developed for the benefit of their constituents.

"A few weeks ago the cabinet of the General Land Office at Washington was enriched by a sample from the new quarries, and we have to-day had shown us a piece of slate recently forwarded to this city. The deposit in question is near the most westerly point of Lake Superior, at the junction of the Northern Pacific Railroad and the Lake Superior and Mississippi Railroad, at a point remarkable for being the very head or intersection of the two greatest valleys on the continent, the valley of the Mississippi and that of the St. Lawrence. Twenty-three miles of down grade toward the east will throw the slate upon the steamers of the great lakes. One hundred and thirty-one miles of down grade toward the south will bring it to the barges of the Mississippi. Thus, as it were, by gravity, can this invaluable roofing material be carried from its natural bed to all the great marts from Buffalo to New Orleans.

"The people of St. Louis are already looking with great interest on this source of supply, and St. Louis capitalists have been prospecting for quarries. That this singular and rare mineral should have been stored at a point so remarkably fitted to be a distributing centre seems little less than providential; no other locality on the continent can send freight to so many people for so few dollars.

"The recent advices from the Minnesota quarries now being opened, show that the shipments will begin with the completion through of the Lake Superior and Mississippi Railroad in August."

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	$9 50@10 50
" green, 1st " "	9 50@10 50
" red, 1st " "	15 00@16 00
" variegated, " "	8 50@ 9 50
Pa. b'k and d'k blue, 1st qual., "	7 00@ 8 00

SHIPMENTS OF SLATE OVER THE LEHIGH VALLEY, AND LEHIGH AND SUSQUEHANNA R. R., AND THE LEHIGH CANAL:

For the week ending August 6, 1870.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Jones & Williams	175 squares.
Kuntz & Woodring	105 "
D. Thomas	70 "
Keystone Slate Co	70 "
Lehigh Slate Co	35 "
Locke Slate Co	35 "
J. J. Thomas	35 "
Total	525 "

SCHOOL SLATES.

D. Williams	180 cases.
Lehigh Slate Co	7 "
Locke Slate Co	8 "
Total	195

MANTLES.

Yerkes & Martin	32 cases.

BLACK BOARDS.

Yerkes & Martin	8 cases.

LEHIGH CANAL.

SCHOOL SLATE.

A. W. Leach	600 cases.

ROOFING SLATE.

H. W. Harper	302 squares.
Saylor & Morgan	840 "
J. M. Coffin & Co	100 "
Total	742 "

LEHIGH AND SUSQUEHANNA R. R.

ROOFING SLATE.

Thomas W. Parry	70 squares.
D. Williams & Co	40 "
Twin City Slate Co	35 "
T. Beck & Co	25 "
T. Schadt	35 "
Continental Slate Co	8 "
Total	214 "

	Week.	Previously.	Total for Year.
L. and S. R. R.	214	5,328	5,542
L. V. R. R.	525	11,865	12,390
Lehigh Canal	742	1,412	2,154
Total	1,481	18,605	20,086

Method of Testing Portland Cement.

Translated from "Die Hydraulischen Moertel" of Dr. W. MICHAELIS.

By Dr. ADOLPH OTT.

Good Portland cement should present a fine and homogeneous powder; it should set firmly and quickly, when used in works exposed to the surf, filling up joints in water works, etc., otherwise too rapid setting is not desirable. It should neither contract nor expand; it ought to assume a uniform, bright, gray-stone color, free from brown spots; it should possess great cementing properties, adhere strongly to the stone, and bear a high addition of sand. Finally, it ought to be free from adulterations, while the ton should have the generally adopted weight of 200 kilogrammes. It is to be recommended, under all circumstances, and even if the cement has been procured from well-known manufacturers, to weigh it on delivery, and to keep an accurate account of it. It is very often the case that the weight is considerably below 200 kilogrammes, due either to the frequent use of the same barrel, which almost inevitably gets smaller, or to bad packing, which produces incompactness; or to unpacking it in smaller barrels, which is often done by second or third hand dealers.

A difference of ten or twenty kilogrammes per ton, which often occurs away from the centres of trade, ought certainly to be taken into consideration, if occurring in larger quantities.

In order to examine cements for their fineness and uniformity of mixture, it is only necessary to pass samples of different barrels through sieves of twenty meshes per centimetre.

There should, properly speaking, remain nothing on the sieve, and under all circumstances, preference must be given to the cement which most nearly fulfills these conditions, for the finer and more uniformly the cement is divided, the more promptly and simultaneously will the chemical reactions take place, the more perfect its combining and cementing properties, and the less fear is to be entertained about a durability of the mass after it has once properly set. The most common adulterations are inferior or spoiled cement, slags, ashes, clay and sand. They are most easily discovered by constant shaking of a sample with an abundant amount of water, after which it is allowed to settle in a high, narrow vessel. The cement to be examined is to be put in the glass filled two-thirds full of water, after which it must be shaken at once, or the cement will cake together, and stick to the vessel. Ashes and clay deposit on top, on account of their smaller specific gravity, and the water in this case generally looks turbid. The upper portion of the sediment generally fails then to harden at all, but exhibits a distinctly different color from the rest of the mass. A close examination of it will then usually disclose the nature of the adulteration.

An addition of ashes may be recognized by treating the upper layer with muriatic acid, upon which an abundant development of carbonic acid will take place, while a plastic residue indicates an adulteration with clay.

Sand will be found divided throughout the mass, but especially in the lower portions. It is discovered in treating the cement, by moderately strong boiling muriatic acid, which dissolves the cement, but leaves the sand behind.

Most dangerous, however, because not recognizable at all, is basic slag, or spoiled cement, which necessarily injures the binding quality and strength. An adulteration of this kind is not very injurious when the cement is not much exposed to the action of water, if a slag is employed that is not too basic, and that sets with lime, as is the case with many blast-furnace slags. In such cases it is acted upon by the liberated lime, and thus it becomes a cement itself, while superbasic and very acid slags, that are not decomposable by acids, behave as inert masses, taking simply the part of sand.

When made into a paste, with sufficient water to produce a mortar which slides smoothly from the trowel, pure cement should not set in less than twenty or thirty minutes.

Yet the view that the most quickly-setting cement is the best, is found to be quite generally disseminated. We read, for instance, in a book on this subject of recent date:* "Excellent cements, such as the Portland cement, Roman cement, and others, if immersed in water, harden in a few minutes, while inferior cements only attain after a few hours such a degree of hardness that they will not take an impression by the fingers."

This view is not quite correct, for it can be proven that rapidly-hardening cements will under otherwise equal circumstances, never attain such a degree of solidity and strength as slowly-setting ones. They will therefore not bear the same amount of sand.

Rapidly-setting cements ought therefore to be avoided when possible, and only used in filling up cracks in water works, or for similar purposes; firstly, because they fail to attain the same degree of solidity, and power of resistance, as the slowly setting ones; secondly, because they can only be worked with difficulty in small quantities, and only giving the best result of which they are capable, when the mason is exceedingly prompt and skillful; thirdly, because they accomplish much less than they really should by being worked in a careless manner, besides causing considerable delay.

For, if the hardening process has once begun in the mortar-box, the most assiduous working up of the solidifying mass will not (especially if more water is added) entirely remedy the evil.

By employing slowly-binding cements, these drawbacks are in a great measure avoided. Portland cement, which, if mixed with the necessary amount of water, say from thirty to forty per cent. in weight, and if not setting in less than twenty minutes, will scarcely increase in temperature: quickly-hardening cement, however, will get hot in consequence of the rapid chemical action which takes place. Still, there exist also limits in regard to slow-setting. If it sets too slowly, it remains resistless, and is pressed out of the joints, for which reason the continuation of the work will be prevented until the mass is sufficiently hardened.

If once set under water, the cement should continually get harder without changing its volume, cracking, or perhaps even falling to pieces. The cement should completely fill the mould in which it has been prepared as thick paste; it should not suffer any contraction by the evaporation of water added in surplus. On the other hand, there should be no increase of volume by swelling.

The tests to be made follow from these considerations.

Small preserve glasses are filled with cement and the necessary quantity of water; another portion is spread over a glass plate, or a previously well-moistened brick, so as to form a cake of about five centimetres in diameter, or a larger surface is covered with a layer of one centimetre. From the rest some balls are formed before it has become solid, or a new portion of the powder is taken, and so much water added that balls may be formed.

TO BE CONTINUED.

* v. Gerstenbergh, die Cemente. Weimar, 1865. p. 129.

American Summer Heat.

To the Editor: Sir—As the hart panteth for the running brook, so do the inhabitants of tropical climes pant during the torrid months of summer for a refreshing temperature.

With a thermometrical heat exceeding 90° in the shade, the energies of those of European origin or descent languish.

Fire has been utilized to protect the human frame from excessive cold—but no similar effective remedy against excessive heat has been made available. The puncha in the East Indies, and the lady's fan to protect from heat indoors, seem to be the chief progress made by man; though nature has done much in the belt of latitude where trade winds prevail, and where such breezes from the sea, constantly blow by day, and cool breezes from the mountains at night, as in Jamaica and the larger West India Islands.

While I am writing, the thermometer in my dwelling-house exceeds 92°, while the same thermometer, inserted in a bucket of water from a deep well on my premises, is only 72°, a difference of twenty degrees. This seems to point at the possibility of sinking shafts and excavating chambers at a few feet from the depth where well waters flow, and thus secure a cool retreat during the hottest part of the day.

By means of lifts, vertical distances are easily obtained in hotels with many stories, and the principle has been applied to ascending monuments, and recently, to the modern subway under the river Thames, in England.

Now that the art of making ice has been discovered and utilized, cool chambers may be secured, possibly, in all hotels, and in large private and manufacturing establishments, on sites of sufficient elevation for the health and comfort of its inmates by it use.

The *modus operandi*, in either case, is simply an engineering question—and, in this age of progress, science and enterprise, scarcely to be deemed hopeless of attainment.

I humbly venture, through your valuable Engineering and Mining Journal, to invite attention to the subject.

The northern cities of the American Union suffer more from heat, at times, in summer, than do smaller cities in the Southern States, but it would be a luxury everywhere to secure a convenient retreat from the enervating heat of summer, as well to the man of business, to invalids, and the sedentary.

Macon, Ga., Aug. 1, 1870. ATONY.

Government Inspection of Mines.

The public and the legislature have now before them the Reports of the Government Inspectors of Mines for the year 1869, and the fact of having access to them, before the Mines' Regulation Bill of Mr. Bruce is further proceeded with, constitutes some compensation for the delays which have been interposed, by the pressure of other and greater measures, between the second reading and the consideration of the bill in committee. The reports are characterized not only by great care and ability, but exhibit a spirit of fairness and justice which cannot but add to their importance and to their influence. There have been, unfortunately, during the past year, fatal disasters, especially in Lancashire and South and North Wales, of unusual magnitude and violence, causing an almost wholesale destruction of life. These were, each and all, subjected to a most careful investigation, and neither expense nor trouble was spared to arrive at a conclusion as to the origin of the accidents, and the means which might, henceforth, be resorted to for ensuring exemption from like disasters in the future. The reports of Mr. Atkinson, Mr. Dickinson, Mr. Higson, Mr. Wales, and Mr. Wardell, are especially worthy of attention for the thought which is exhibited in their composition, and for the reasonableness of the remarks which they make, as well as the general practicability of the suggestions which they put forward. Her Majesty's inspectors, we think, without exception, fully and cordially recognise the fact that a decided improvement is going on in mining operations, although proceeding at a pace somewhat slower than they desire, and had hoped to find in existence. The owners, it is admitted, exercise more supervision, and the men themselves exhibit a certain advance in intelligence, and particular attention to safety, as well as in their general conduct and habits of life. That is the golden side of the shield. The other side—the leaden one—is not, as may be supposed, quite so bright or satisfactory. Systems of ventilation are still, especially in mines planned many years ago, defective in a very considerable proportion of the workings throughout the country; dangerous falls of roof, from deficient or clumsy timbering, are far more frequent than they should be, and powder is used, even ordinarily, with far too little care and caution by the working miner. The reports, generally, concur in an expression of opinion that the police of our mines is, like the police of society on the surface, insufficient in power, and defective in organization, and that by-laws and working regulations are very extensively disregarded or wilfully set at nought; and it is further observed that the managers and viewers underground are too frequently not up to the standard in knowledge and ability which the inspectors think ought to be established. Nearly all the inspectors of fiery districts express themselves entirely dissatisfied with the safety lamps, to which the country has, hitherto, attached high value, and warn the mining interest against trusting to their efficiency.

Such is the aspect presented by the leaden side of the shield, and it cannot be denied that there are truth and reality in it as well as in the golden one. The question is—How are we to turn the leaden face into a golden one, and to make both sides alike? We are satisfied that masters and men are both most anxious to attempt the enterprise, and to carry it to a successful conclusion, but there have been, and are, many serious obstacles in the way of each, which the public have not had the patience to inquire into, and for which neither class, therefore, has obtained fair consideration. Some of these obstacles are the creation of nature, with whom science, advanced as it is to a high pitch, is still unable to grapple with assurance of success; and others are the result of agitations set on foot by persons who make capital out of them, and, by exciting a population easily stirred up to imagine wrong, and exaggerate facts till they become falsehoods, keep apart the employers and the employed by raising a barrier of antagonistic feeling between them, and thus prevent an *entente cordiale* between two classes whose co-operation in enterprise and working details is essential both to ensure safety and secure profit. Upon this point Mr. Higson has some most valuable remarks, which are the more valuable because he has shown the most perfect impartiality throughout his report in judging between the masters and the men. Mr. Higson says: "It is a great mistake, on the part of persons speaking on platforms to the working population, to attempt to flatter their vanity by telling them of wrongs, of imaginary evils and oppression, instead of giving them wholesome lessons of instruction, of encouraging them to be honest, industrious, and careful. They are on all occasions crammed with complaints of legislative neglect; and no class suffer so much from this source of discontent as miners. Among their leaders there are some very good men, and a great many not sufficiently wise to be always followed. If they had the welfare of the men at heart they would on every occasion impress upon their minds the necessity of strictly observing all laws, both moral and legal, whether acknowledged or established. It is unnecessary to ask the question, when past events give the answer, but, is this ever done?" The true way of suppressing these sowers of tares among the wheat is to bring the masters and men into closer and more personal connection, and to prevent their relations being either settled or disturbed by outside conductors of agitation, who concern themselves only with developing the weak points in each class, and have a positive interest in keeping them apart. Some little advance was made in this direction during 1868 and 1869, and a step was taken towards the establishment of co-operation between masters and men when the provisions of the Mines' Regulation Bill were under the consideration of the Mining Association, on the one hand, and a delegated body of the working miners, on the other. The step, however, was the result of individual action on the part of some of the members rather than of a move on the part of the association as a body, and the advance appears to have gone no further than that first step carried it. We have always regarded the continuance of this barrier between masters and men as one of the greatest of the disadvantages under which the mining industry suffers, and we much regret that the Mining Association have not made some decided efforts to remove it.

With regard to the difficulties of the mine-owner, created by nature, and, hitherto, imperfectly opposed by science, we would direct the attention of the public to the following facts: "It should be borne in mind that the great demand for coal has recently induced the opening of many new pits, and that, in the instance of one of the most fatal disasters, the mine-owner was tentatively tapping a virgin reservoir of most fiery gases. In the old established pits there is also this increasing disadvantage, that every year it becomes necessary to go to a greater depth to obtain coal, and that the workings extend over a far greater area than they did only a very few years ago. We need hardly explain, probably, to the least scientific of our readers that, as depth and area increase, so do liability to accidents become more frequent and less controllable. This is attempted to be provided against by more powerful ventilation, and by driving currents of air at higher velocity through the ways of the mines. This remedy, while it meets one kind of danger in part, creates another, by in some degree diminishing, under certain circumstances, the preventive power of the so-called safety lamp. In some mines the owners, in their anxiety to provide ventilation sufficient to deal with 'extraordinary' circumstances, have carried it to such a pitch that the inspectors state the men have complained that the current of air was too strong to work in. Science has not yet been able to show the mine-owner how, while maintaining a sufficient ordinary ventilation, he can hold in his hand a reserve of fresh air which, when an emergency arises, he can drive through the ways of his mine with suddenness and power sufficient to meet and defeat the fiery gases that rush out upon them; nor has it invented a lamp yet through which, at high velocity, the gases will not pass. These are some of the difficulties of the mine-owner. The consideration of the remedies suggested by the government inspectors we shall deal with in our next impression, as it is evident, from Mr. Bruce's reply to Lord Elcho, that there is no prospect of the Mines' Regulation Bill getting into committee till after next week."—*Colliery Guardian.*

THE ENGINEERING AND MINING JOURNAL.

CONTENTS FOR THIS WEEK.

[*Illustrated Articles are marked with an asterisk.**]

The Cañons of the Snake and Columbia..... 97
The Laws of the Deflection of Beams exposed to a Transverse Strain, tested by Experiment. 98
MINING SUMMARY..... 100
ON-DIT ABOUT MINES AND METALS 101
SPECIAL SCIENTIFIC BREVITIES.. 101
MISCELLANEA 101
MARKET REVIEW..... 102
THE SLATE TRADE..... 103
Method of Testing Portland Cement 104
American Summer Heat 104
Government inspection of Mines 104
The Diamond Region of South Africa..... 106
Swedish Railway..... 106
EDITORIALS :
American Lead Mines..... 105
The Removal of Rocks at Hell Gate..... 105
Keeping Cool..... 105
The Owyhee District—Idado.... 105
Mining in Eastern Oregon..... 105
American Institute of Architects 105
The Mitrailleur..... 107
OFFICIAL LIST OF PATENTS..... 107
Fire Protection for New York Harbor 108
Krupp Steel..... 108
Mineral Land for Sale..... 108
BUSINESS AND PERSONAL 108
How Nitro-Glycerine is kept and used in the Hoosac Tunnel... 109
ADVERTISEMENTS 109

ROSSITER. W. RAYMOND, Ph. D., Editor.

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American Lead Mines.

THE lead-mining industry of this country has been for some time declining, and was never very prosperous, except in the Western States, where the deposits of galena in the irregular caves and crevices of limestone had been for many years exploited in a rude and speculative way. The consumption of lead in this country amounted last year to 50,000 tons, of which 37,500 were imported. Of the remaining 12,500 tons, about 11,000 were produced in the West. This amount was not even sufficient to supply the demand of that section, the consumption in the West having risen to 15,000 tons. For certain purposes, moreover, especially for the manufacture of white-lead, the American article is said to be inferior, by reason of impurities. Meanwhile, the superior foreign article can be delivered at St. Louis, *via* the Mississippi river, at a cost for freight of only 3.2 mills per pound, shipmasters being glad to bring it as ballast. We are thus defeated in our own market.

The remedy lies in improved methods of mining and metallurgy. Both the manner of extracting and the manner of reducing the lead ores of the West are wasteful. Gouging chance deposits and smelting the ores in hearths is not a permanent and economical industry; and the localities where the abundance and purity of the ores permitted it, are rapidly becoming exhausted.

There are mines in the country which ought to be regularly producing lead at a profit. The Mine la Moth, in Missouri, is one. Many of the "base-metal" silver mines of the Territories are already supplying the Pacific market with lead, as a by-product. In the East, we have fine lead mines in Virginia and North Carolina, some of which are already in successful operation. The great difficulty with many mines, such as the Erie, in this State, is the presence of considerable zinc-blende in the ore. But the production and extensive use of "Bartlett oxide," a pigment manufactured from a North Carolina zinciferous galena, and now competing in the market with zinc-white and white-lead, should lead the proprietors of such mines to experiment upon their ores, with the view of producing similar saleable compounds, and thus turning the troublesome impurities to good account.

Speaking of lead mines, what has become of the once celebrated Rossie? The Coal Hill vein, at this place, discovered about 1836, produced up to 1858 about 4,000,000 lbs. of lead. It was proposed to re-open it in 1863, but the scheme appears to have been dropped, and for several years we have heard little about the mine. If working at all, it must be on an inadequate scale.

The Removal of the Rocks at Hell Gate.

THE serious obstruction offered to the commerce of New York by the dangerous rocks in the channel of Long Island Sound, near the point mentioned, has long been felt by the commercial community, and various plans have been suggested, and several of them practically tested. Most of these plans consisted essentially in placing the explosive compound (powder or nitro-glycerine) on the surface of the rock, and exploding it by means of electricity. In one or more of the plans tried, holes were bored in the rock and the explosive compound fired in them. These plans, however, are each subject to certain objections which seem practically to have caused them to be abandoned, and in their place we have the plan of GEN. JOHN NEWTON, of the United States Engineers, who, for some time past, has superintended the operations. This plan consists in sinking a shaft some thirty feet in the rock, and running levels from the bottom in various directions, and then sloping above these levels, leaving only a roof of rock between the workmen and the bed of the Sound. These levels are then to be connected by galleries, leaving only pillars of sufficient size to support the roof. When this is completed, it only remains to place the explosive compound in the mine thus formed, and blow up the whole at once. The debris will fall back into the chambers previously blasted out, and fill them up to a slight extent, but as they will run to such a depth below the water that after receiving the debris there will still be thirty feet of water at mean low tide in the places now obstructed by the rock, nothing is to be feared on this score. Besides the removal of these loose rocks, if it should hereafter be found necessary, would be comparatively an easy undertaking. This plan will be pursued on the rocks which now obstruct the channel off Hallett's Point. The work of building a large cofferdam from this point, extending fifty feet into the river, was begun sixteen months ago. In the meantime the dam has been completed, freed from water, and a large shaft sunk to the depth of thirty-two feet. The operations at Hallett's Point have been under the immediate direction of Mr. G. C. REITHEIMER, whose experience gained in blowing up the mountain at Holyhead, England, fits him particularly for this position. The mine which he there constructed and blew up, contained twenty-one thousand pounds of powder, all of which was ignited at once. Blossom Rock, in the harbor of San Francisco, was lately blown up by this same system, but the undertaking was a much easier one, being in a soft sedimentary rock, instead of the hard gneiss which is found at Hell Gate. At the same time, aside from its hardness, which is not so very great, the gneiss which abounds on Manhattan Island is seldom found to contain cleavages, which often render a hard rock an easy and inexpensive one to blast. Steam-drills are to be employed in running the levels, which will be ten in number, with an average length of 150 feet, and connected by cross-cuts at short intervals. The mine, when complete, will present a ground plan very much like a spider's web, the levels forming the radii from the central shaft, and the cross-cuts the concentric circles.

The completion of this work, and the removal of Frying-pan Shoals, Pot Rock, Way's Reef, and one or two smaller obstructions, will open to the commerce of New York a much shorter route to Europe, and it is believed that enough additional water would thus be allowed to pass through the East River and out of New York Bay to cut a deep channel through the bar at Sandy Hook, and render that also a practical route for vessels at all stages of the tide, and in all weathers.

Keeping Cool.

IN another column we print a letter from the South, *apropos* of hot weather, and recommending scientific inventions to help people keep cool. Our correspondent's feeling, with regard to the hot weather, we can fully appreciate, and his desire for relief seems in the highest degree natural. We confess, it seems a little singular that when this interesting experiment of inserting the thermometer in the bucket of water was made, the simple idea of inserting himself, in place of the thermometer, did not suggest itself, rather than the elaborate under-ground-chamber system. He must have thought it necessary to go to the well, as we go to bed, "because the bed won't come to us;" but the bucket should have taught him better.

Talking about bed, suggests to our mind the bed's tropical cousin, the hammock. Lying in a hammock, in the shade, where a breeze will reach one, appears to us to be more comfortable in hot weather than either an ice-house or an underground chamber. If the latter expedient is preferred, however, nearly every house in New York, and, in fact, throughout the Northern States generally, is already supplied with an underground chamber, vulgarly called cellar. If absence of heat is the only desideratum in hot weather, why don't families congregate in these already provided underground-chambers? The truth is, people can't afford to become vegetables, just to keep cool.

Moreover, our correspondent must allow that, though the air of a cellar or a mine be cool, it certainly is not agreeable, and we doubt very much if it ever could be made so. Both artificial and natural ice are so expensive that nobody would feel justified in maintaining such a costly luxury for his exclusive use. And if a large room were used for the purpose, so as to accommodate a crowd, those only who were near the walls would feel the benefit, while those in the centre would be nearly or quite as warm as they were before.

The best possible cooler in warm weather has been supplied by nature in the process of perspiration and evaporation, constantly taking place from our bodies. The latent heat of steam varies, according to various authorities, from 950 to 1,008 heat units. Thus, to convert one pound of water into steam of the same temperature about 1,000 heat units, or an amount of heat sufficient to raise 1 lb. of water 1,000°, or 1,000 lbs of water 1°, is rendered latent or destroyed, so far as it can have any direct effect in raising the heat of our bodies. Now, anything which will facilitate this evaporation from our bodies affords great relief in hot weather. Thus a draft, or a supply of fresh, dry air, even if it is warm, cools us very considerably, because it promotes evaporation. To supply an artificial breeze, the fan mentioned by our correspondent is an almost universal medium, and the only objection to its use is that the physical exertion required to move it warms us nearly as much as we are cooled by the breeze which it produces. Revolving fans, worked by machinery, are in use in several factories in this city, and accomplish a very good purpose. Since men cannot afford to sit idle in a chamber or room underground, or cooled by ice, it appears to us that the desired cooling process is much easier of attainment by the promotion of free perspiration and evaporation than in any other way. This is fortunate for laboring men; and, as a matter of fact, we believe that persons actively employed, when not exposed to the direct rays of the sun, suffer less from heat than those who exert themselves only in trying to keep cool.

The Owyhee District—Idaho.

PRIVATE correspondence reports that the Golden Chariot mine is looking very well, the indebtedness is paid up in full, and the mine now appears to have proved itself a valuable piece of mining property. The Ida Elmore has been considerably depressed, but is now looking better. The Poorman, true to his name, fails to show any improvement. The Corduroy has had but little ore worked, and the Peck and Porter none, but both mines are looking very well. A steam-engine has been ordered, and is now upon the way, upon the arrival of which the latter two mines will be worked together. Some work has been done on the Surplus Oro Fino; and other small operations, which have been lately undertaken, present very promising features, so that, as a whole, the district exhibits a cheerful aspect.

Mining in Eastern Oregon.

THROUGH private sources we learn that matters in this district are looking very favorably, although the season has thus far been a very dry one, and rain is fervently wished for by the miners. During the month ending June 10th, sixty thousand dollars worth of bullion was shipped, per express, from Baker City, and it is estimated that at least twenty thousand more was taken away by private parties. One nugget, weighing one hundred and eighty-eight ounces—fifteen and two-thirds pounds—worth three thousand dollars, was found in the latter part of June at Gimletville, near Auburn. It is described as a pear-shaped gold-boulder, containing apparently but very little rock. The Ruckle mine and mill seems to be doing a very good business under the management of Messrs. BROWN & VIRTUE. The mill is running night and day, but as the results are kept very private, it is impossible to say how well they are doing. There is but little news from most of the mining camps. From Amelia, Malheur, Eldorado, Humboldt Basin, and Clark's Creek, we learn that some sluicing is being done. Drifting and washing in rockers will probably occupy the remainder of the season. The Pocahontas is doing very well. At the Eagle Creek mines one hundred Chinamen are employed. Little activity is displayed in mining enterprises at Auburn at present. As the mining in this district consists entirely in working placer deposits, we consider this news encouraging. Eastern Oregon presents a large field of deposits of medium richness, and will doubtless hereafter attract considerable attention as soon as the veins which supplied them are discovered and worked. This will of course require time and a considerable outlay of capital, but is quite certain of final accomplishment.

American Institute of Architects.

AT a special meeting of the Board of Trustees, held July 14th, 1870, in this city, upon the opening of sealed ballots, the following candidates were declared to be elected *Fellows* of the Institute:

N. H. HUTTON, Baltimore, Md., (formerly an Associate).
JOHN R. NIERNSÉE, Baltimore, Md.
J. CRAWFORD NEILSON, Baltimore, Md.
THOMAS DIXON, Baltimore, Md.

At a Special meeting of the Board of Trustees held August 1st, 1870, the following business was transacted:

Upon the opening of sealed ballots, the following candidates were declared to be elected *Fellows* of the Institute:

E. G. LIND, Baltimore, Md., (formerly an Associate).
THOMAS FULLER, Albany, N. Y.
AUGUSTUS LAVER, Albany, N. Y.
CHARLES W. HEARD, Cleveland, O.
WALTER BLYTHE, Cleveland, O.

PHILADELPHIA CHAPTER.

In September next the Philadelphia Chapter of the American Institute of Architects, intend to commence a permanent and free Museum of Building Materials and Appliances, as well as of Constructive and Art Models. This early announcement is made that contributions to it may be sent in time, to be properly labelled and arranged before the Museum is opened. It is proposed to embrace in the collection all materials, inventions and contrivances useful in building operations of all kinds, as well for construction as for ornamentation. This, of course, covers an extensive ground, and it may seem hopeless to attempt to make a museum of this kind at all complete. It will, no doubt, depend upon the willingness of manufacturers and others to exhibit their productions, for the Chapter will provide opportunity to all those disposed to contribute. Such a collection cannot but prove a very interesting as well as useful one to the general public, and will be equally useful to the exhibitors in affording an opportunity for the display of their productions, and of their comparison with others of a similar kind.

The following is the proposed classification of the collection, which, however, is subject to such modifications as experience may dictate:

I. MATERIALS.—*Stones*, of all kinds and textures, suitable for building purposes—Granite, Gneiss, Limestone, Serpentine, Buhr stone, Argillaceous stone, Freestone, etc. Specimens of these to be in blocks 4 inches square on ends and 6 inches long, finished in different manners on the several sides, one end being left with its rock face, without tool marks. *Bricks* of all kinds. It is intended to include under this head not only the manufactures of different materials, but the different forms into which the material is made. *Marbles*, not only those used in building operations, but those suitable for decorative purposes. Specimens coming under the first description, to con-

form in size and finish to the description given for other building stones. Those for decorations to be in inch slabs 10 inches by 12 inches, polished on face or faces, as the case may require. *Slates*, of the various colors and qualities, suitable for roofing and other purposes. *Flagging*, Fire Stone, Soap Stone, Micaceous Slate, etc. In pieces 10 inches by 12 inches in size. *Artificial Stones*, Stained and Polished Marbles, Enamelled Slate, prepared by the various processes. The first mentioned to be in such sizes as are usually made, the last to conform to other polished marbles. *Cements and Limes:* They should be in the form ready for use, and should be contained in 8 oz. "salt-mouth" white flint bottles, with glass stoppers. It is desirable that specimens of the stones from which they are made may accompany each sample. *Woods*, of all kinds, suitable for construction and decoration. To be in uniform pieces 1 inch thick, 8 inches wide, and 12 inches long, properly dressed on some or all of the sides, as may be most appropriate. *Metals*, and their combinations, in bar, pig, or sheet. *Glass* of various thicknesses, qualities, and colors, in uniform pieces 6 inches by 8 inches.

II. BUILDING APPLIANCES.—*Tiles*, for roofing purposes. *Felts*, for roofing, deafening, etc. The specimens to show the different systems of jointing. *Terra Cotta Cement and Clay Pipes*, drains, etc. *W. C. Apparatuses, Cocks, Traps, Metal Pipes*, etc., and other contrivances in Plumbing. *Furnaces, Steam-heating Apparatuses, Grates, Ranges*, etc., set forth in drawings, properly mounted on frames for hanging. *Iron Mongery*, including nails and screws of different sizes and shapes, locks, bolts, latches, hinges, springs, etc. *Wire Rope*, Cotton and Hemp Sash Cords. *Gas Fittings*, brackets, and hanging lights, of various patterns; if of large size, to be set forth in suitable drawings, mounted or framed for hanging. *Terra Cotta*, in forms suitable to architectural ornamentation, and in limited sizes. *Lightning Rods, Points, Fastenings*, etc., of improved construction. *Rain Troughs, Conductors*, etc.

III. DECORATIONS AND FITTINGS.—*Tiles*, Encaustic, Plain, Enamelled, Majolica, etc., for floors, walls, etc. *Wall Papers*, in books of the width of the roll, and 24 inches in length. *Floor Coverings*, such as carpet, matting, kamptulicon, etc., in pieces of sufficient size to show pattern and quality. *Parquetry and Inlaid Woods*, suitable for flooring and wall decorations. *Cast Ornaments*, of Plaster of Paris, Papier Mache, Carton Pierre, etc. *Stamped Ornaments*, of metal, wood, leather, etc. *Mouldings*, such as architraves, skirtings, etc., in wood and other materials. *Textile Fabrics*, suitable for curtains and other upholstery.

IV. EXAMPLES OF SKILLED WORKMANSHIP.—*Stone Carving*, in details, suitable to architectural decoration, in conventional or natural forms, at the discretion of the carver. *Wood Carving*, of similar character. *Wrought Metal Work*, in the form of hinges, straps, finials, vanes, etc. If of large size, set forth in drawings mounted or framed for hanging. *Cast Metal Work*—Cast iron in pieces suitable for building and architectural decoration. *Stained Glass*, of various styles, in samples of limited size, set into suitable frames, with hooks for hanging. *Plain Painting, Staining of Wood, Decorative Painting, Stencilling*, etc., on panels of wood, or plates of zinc or other metal.

V. CONSTRUCTIVE MODELS.—*Models*, exhibiting systems of roof, floor, or other framing, whether in iron or wood. *Models*, of inventions and contrivances useful in or applicable to building. *Models*, of scaffolding and arch centres of novel construction.

VI. ART MODELS.—*Models*, of buildings. *Casts*, of parts of meritorious buildings, whether old or new.

VII. RELICS.—Parts of buildings, and articles connected with buildings, possessing interest as antiquities.

It is desired that no label or other mark be pasted on the specimen, in order that the labelling may be done uniformly. Full particulars concerning each specimen are to accompany them, with the name and address of the exhibitor; all of which will be entered on a register to be kept for the purpose, besides being clearly stated on the label. Articles in Classes V, VI and VII, may be deposited with the Chapter on loan, or donated to it, at the discretion of the owner. Proper shelving or cases will be provided by the Chapter for all specimens sent, and due care will be taken of the articles. The Chapter is not prepared to pay express or other charges upon the articles sent to it, unless in exceptional cases coming under Classes V, VI and VII, when special arrangements will be made by corresponding with the Secretary. Contributions to the Museum will be received up to the time of opening, by either of the undersigned at their private offices.

JOHN MCARTHUR, Jr., Pres't, 205 South Sixth street.
HENRY A. SIMS, Secretary, 426 Walnut street.
PHILADELPHIA, July 15, 1870.

The Diamond Region of South Africa.

MANY contradictory reports are going round the papers concerning the value of the new diamond mines near the Cape of Good Hope. We have the good fortune now to lay before our readers a reliable statement of the condition of things there.

It is well worthy of notice that everything is found to be supplied, when wanted, in the right quantity. Iron and coal, of which so much is wanted, are most profusely distributed. When the whales were giving out, petroleum was found; when more gold and silver was wanted for the purposes of industry, and as a circulating medium, large deposits were found in California, Australia, and other places; but not so profusely as to reduce its value. Even when the supply of objects of luxury, such as diamonds, is getting too much exhausted to furnish those who admire them, new deposits are found, but just in such small quantity as not to reduce their real or imaginary value, as too great profusion would make them too common, and consequently less valuable for the select few who now only can afford to buy them. It is known that the East Indies contained the original source of supply of this most beautiful of all gems. These mines, however, have been long since nearly exhausted. Brazil was the country from which, during the present century, the most of the diamonds were obtained; but Brazil is producing yearly less and less, and when a new source of supply was desirable, it was found at the southern extremity of Africa. The diamond country there is a large undulating prairie, interspersed with flats. There are numerous dry beds of so-called rivers, which, when full, we would call creeks. They soon run dry after the rain ceases, but water may be obtained by digging in these apparently dry beds. The diamond fields are fully 5,000 feet above the level of the sea. The Vaal, Orange, and Hart rivers run through this district; they are too shallow and full of falls for navigation. The country where diamonds have been found consists of flats and undulating grounds; the rivers have not been prospected. The natives have hitherto found most of the diamonds, and on the surface only; they never dig for them. About a dozen join hands and walk abreast across a plain, and when they see

A SHINING PEBBLE

they pick it up; if not a diamond, they throw it over their shoulder and go on. Some white men have latterly commenced to sift the dry sand, and it is said with success. Many small diamonds of half a carat are being found. The beds of the rivers cut into the soil from twenty to sixty feet, with mostly sandy bottoms; some have stony bottoms also. All the diamonds discovered so far have been at great distances apart, except at Du Ploy's farm, on the north side of the Orange river, where

HUNDREDS WERE FOUND

in two weeks. Most of the diamonds have been discovered in an alluvial soil; but some have been found in limestone soil, called here "kalk," (a Dutch word, meaning lime or limestone,) and some have been found in soil composed of pebbles, quartz, and crystals. The line of country along the banks of Orange, Staarte, and Vaal rivers, say 300 yards from the water, has been most prolific of diamonds. At Jacobsdal, in the Orange River Free State, over 300 were found in one week by sifting. They were mostly small. This part of the country belongs to Waterboer, a native chief, from whom it would not be difficult to procure permission to prospect.

SOME OF THE DIAMONDS.

The following diamonds turned out satisfactorily in Europe, where they were sent: No. 1 weighed 21 carats (found by a child named Jacobs—value, $2,500); No. 2, 4½; No. 3, 1; No. 4, 3; No. 5, 19; No. 6, 9; No. 7, 10½; No. 8, 30½; No. 9, 26; No. 10, 13; No. 11, 13; No. 12, —; No. 13, 9; No. 14, 47. Sold all the way from $50 to $4,000. The Star of South Africa was the largest, 83½ carats; sold for $55,000, and sent to Amsterdam to be cut. There have been found in South Africa over fifty diamonds of over 4 carats weight, and hundreds under that down to half a carat. Messrs. Dunnel, Ebden & Co., of P. E., have received from their correspondents up the country over 200 diamonds; Blaine & Co., 150; Maynard, Buchanan & Co., 50; Menthal & Co., over 200; Adler & Co., 30; Savage & Hill, 20. Carbonate or imperfect diamonds abound plentifully at the mines; they are found in a limestone formation. Garnets, rubies, sapphires, and topazes have been found also. There are

VARIOUS MODES OF MINING

for diamonds. Of course washing for them is best, but in this country, when water is scarce, dry sifting is best. The diamond fields cover over one thousand square miles, and extend from longitude 24 to 28 east, and from latitude 27 to 30 south. The first settlers of this part of the world being Hollanders, like those of New York, many words and names, and also customs, of that land are still found at the Cape. In fact it belonged to Holland up to a comparatively recent period, being finally ceded to England in 1815, Holland then relinquishing all claims in exchange for Belgium. The secession of this country from Holland in 1830 was even more vigorously favored by England than that of our Southern States, and successfully too, while they fortunately failed here. A large river in the region in question is called after the principal arm of the Rhine, the Waal, just as in New York State we have a Walkill and Catskill. This name is now changed into Vaal river, and there the diamond fields are at length turning out to be a most decided and entire success. We now learn from authentic sources that a regularly-organized community of diggers has been formed near the Vaal, at a short distance from the Mission station of Phiel, and on the opposite bank of that river. No less than one hundred white men are at the present moment actively engaged in these diggings. A set of regulations has been carefully drawn up, and is strictly enforced by a vigilance committee elected by the whole white community there located. Some eighty persons have bound themselves together by signing these regulations. The earth or the soil is not generally washed on the spot where it is dug out, but is removed in carts and wagons to the banks of the Vaal river, there to be washed and carefully sifted or screened. By this means many large and valuable gems have already been discovered. It is likewise projected to search, as soon as circumstances will admit, the bed of the Vaal river by means of dredging, and then wash and closely examine the sand thus obtained. Scotch carts and wheelbarrows are, we are assured, in great demand, and would sell quickly at remunerative prices. If such be the case, it will not be long before all the Scotch carts in the Cape colony will be found at the diggings. The diggers have obtained their present right or permission to search for diamonds from the Coranna Captain, Jan Blom, or his son, but the country in question is likewise claimed by the Free State, the Transvaal republic, by the Batlaping Chief, Yanki, and by the Griqua Captain, Waterboer. Diamonds are found on both sides of the Vaal, and have been picked up at considerable distances from the spot where the present diggings have been commenced—which, we may add, are situated in what is known as the Campbell Grounds. It is confidently anticipated that within twelve months at least one thousand men will be actively engaged on the South African diamond fields, and if so, in all probability these men will be a "law unto themselves," and will not deem it necessary to ask for any protection from the natives, beyond that of their own right arm. These diamond fields are but two days on horseback from Bloemfontein, or perhaps a little over one hundred miles. Among the names of the successful diggers, we hear of the King William's Town party, under Mr. MCINTOSH. A Mr. WALDECK and Mr. COETZEE are also mentioned as being among the successful seekers or purchasers. A diamond worth £1,500 was disinterred from a hole at only a short distance from where our informant was temporarily staying, and this was sold by a Coranna, the lucky finder, for a wagon and oxen worth about £120, or, at most, £140. Other diamonds, worth £200 to £300, have been picked up, and many worth £50 to £60. The most active diggers are merely disposing of their small diamonds to pay for the necessaries of life, and are hoarding up all the more valuable ones. A few beautiful rubies have likewise been discovered; and one turquoise—a piece of which we have seen, it having, unfortunately, been smashed by the finder in order to see what the inside looked like—has been unearthed. Most of the landloopers and bondeldragers, and idlers in general, from all directions, are assembling at the diamond fields, and depend upon it, all in South Africa who are out of employment will not be long in wending their way thither. Our informant says that even now it affords so curious and busy a scene to people who have been long in this proverbially slow country, that it is worth going a hundred miles to witness. The fact is, if half we hear be true, these same diamond fields will very quickly revolutionize the whole of South Africa.

Swedish Railways.

IN a recent number of *Engineering*, we published a letter on "Light Railways in Sweden," addressed to us by Mr. C. P. SANDBERG, and accompanied by the translation of a discussion between certain railway engineers and members of the Diet in Sweden—a discussion, of which the continuation is now being printed in our columns. This communication suggests some considerations of great practical interest, not only to Sweden, but also to our own country. From the information thus furnished, we may conclude that in Sweden, as indeed in many other countries, the mistake has been committed of adhering to one particular system of railways, copied from England or from some part of the continent, without paying due regard to the differences in the physical and social conditions of the two countries, such as the sparseness of population, the small amount of traffic, and the limited means at the disposal of the nation for further construction; and although we have no fault to find with the construction, as far as it has hitherto been carried out, it must be admitted that the delay in completing the entire system of railways must have greatly hindered the development of the resources of the country. But as industrial speculation has increased, the railway fever has now again become rife in Sweden, and there is naturally a voice of warning raised against the extravagance of continuing the old expensive system of railways. This has consequently led to a contest between politicians and engineers, the men who grant the money and those who spend it. The contest has, however, been nobly conducted, and free from personalities, while both sides of the question have been fairly enough argued. In pronouncing a decision in the case, we think that it requires but little consideration to declare in favor of the Government, who propose to complete the system with the 4 ft. 8½ in. gauge, but with light rolling stock, using, however, for branch lines, the 3 ft. 6 in. gauge.

Similar questions are now in agitation with respect to the extension of railways in Russia, India, and Canada. Two 3 ft. 6 in. lines are being experimentally constructed in Russia, the one by the Government and the other by private capitalists. Should this experiment be successful, it will decide the adoption of that gauge for the extensive system of branch lines required in that vast empire. While many countries are thus in a state of indecision on the subject, Norway finds herself free from this difficulty, thanks to her engineer, CARL PIHL—for, as we mentioned some time ago, the main lines in Norway are chiefly laid with the 3 ft. 6 in. gauge.

Norway, indeed, is the only country where the narrow gauge system of railways has been efficiently carried out, for there the old school of costly construction was quickly superseded by a more advanced system, in which adaptability was the one first consideration. Mr. PHIL may be fairly considered the apostle of this new school, for in no other country have cheap railways been adopted as a standard, and even in those places which we have already quoted as having introduced, or which are now introducing, narrow gauge lines, the distance which the rails are placed apart, appears to be the ruling consideration, whereas, in reality, this is but one of the many items that go to make up the total of cheap railway construction. Benefiting by the experience in the sister country, Sweden has, to a limited extent, availed itself of the results of Mr. PIHL's work, and 3 ft. 6 in. gauge railways have been in operation there for some time. But the standard gauge, nevertheless, is the ordinary one of 4 ft. 8½ in., and the whole of the prolonged discussion ostensibly relates to the question, whether it is advisable to complete the main railway system of the country to the standard width, or whether it would be preferable to adopt a cheaper construction and a narrower gauge for the comparatively short length yet remaining to complete the system of main lines.

It is difficult to imagine so protracted a discussion upon so simple a problem as the one immediately involved, and it is,

therefore, only fair to consider that it bears reference to the general rather than the special question. Doubtless, it is a grave error to establish an extravagant system of railway construction, but once adopted, and developed to a large extent, the error would be more serious to make a broken gauge, and the first outlay that would be economised would be speedily swallowed up in the various expenses which would be incurred, to say nothing of the various and constant inconveniences inseparable from such a change.

Mr. ELWORTH, an engineer upon the Swedish Government railway staff, and one of the chief champions of the uniformity of gauge, takes unnecessary pains to establish his case, and advances figures which are based upon somewhat obscure data, to prove that a saving only of £477 a mile would be effected by building to the 3 ft. 6 in. instead of 4 ft. 8½ in. guage. And this saving, he proceeds to demonstrate, would speedily be consumed for the separate rolling stock required, the independent shops, and engine and carriage sheds, the distinct management, and the cost of shifting loads from the line of one gauge to that of another, and a loss altogether of more than £25,000 on the proposed extension, would be the result. Without caring further to inquire into calculations which cannot be considered fair, we need only consider the question of expedience with regard to breaking the gauge in the main system of Swedish railways, and every argument tells against the advocates of these views Mr. ELWORTH opposes. The narrow gauge railways of Norway are amply sufficient for the traffic requirements of that country, and will continue to be so, till the uncertain future shall have brought with it largely increased demands, when further expenditure for additional accommodation will be justifiable. And equally so with Sweden; but as its railway system was established before the days of narrow gauge lines, there remains nothing for it but to continue them of the same width. But not in the same manner, and taking example by Mr. PIHL, the Swedish engineer before alluded to, he addresses himself in the right way to the task of making the best of existing circumstnaces. He knows that a 4 ft. 8½ in. gauge does not necessarily involve a great outlay in original construction, and he very clearly demonstrates that, by the adoption of light rails, of minimum formation width, of cheap stations—in fact, of all the elements which together compose a cheap railway, whatever may be its gauge, the standard system may be kept intact, the outlay may be kept down, and that Sweden may complete the Upsala-Storvik with no fear for the result.

With the secondary system, however, matters stand very differently, and the advocates of the 4 ft. 8½ in. gauge could scarcely hold their ground. For the most part these lines would have a purely local importance, effecting no junctions with the main railways, and, as a rule, they would be built for the development of the mineral wealth of the country, which must be idle and useless until means are provided for its transport. We have already stated that Sweden abounds in rich iron ores, and that she could—the means of transportation being provided—place an unlimited quantity at low prices at the disposal of our steel manufacturers.

To effect this a number of cheap independent railways would be required, connecting the mines with the coast, and it is toward the construction of these that public attention is being specially directed in Sweden. For they are more important than the completion of the State main railways, seeing that the future commercial prosperity of the country is dependent upon its mineral wealth and upon that alone. Sweden cannot ever become the seat of a large iron manufacture, for the cost of fuel forbids such a result; and it only remains, therefore, for her to transport her ores to a market where they will find an inexhaustible demand, and which would at once confer prosperity upon herself and lend invaluable aid to the industry which year by year must assume larger proportions—the manufacture of Bessemer steel.

Diverging, therefore, from the comparatively unimportant question of gauge for the State railway shortly to be set in hand, the great discussion which even now is earnestly going on in Sweden, is embracing the general question, and while at the same time that private enterprise to serve private ends, is energetic in its efforts to promote the wealth of the country, the government has before it a higher and more comprehensive duty, in stimulating and assisting those endeavors. The great importance of action is acknowledged, the means to be taken are no longer problematical, and Sweden has for her nearest neighbor a country from which she can gain experience, and whose railway system is even at the present time being officially inspected in reference to its adoption in India, where cheap narrow gauge railways are now acknowledged to be all important.—*Engineering.*

The Mitrailleur.

To destroy your enemy in the shortest time, in the easiest manner, and at the least possible expense, is the first maxim of war. The stone that whistled from David's sling, the bullet of the "zundnadelgewehr," and the volley of the "machine-gun" had all the same object. Since the days of Roger Bacon the aim of all improvements in fire-arms has been to carry the greatest possible number of deaths to the greatest possible distance. Grape, canister or case, and shrapnel, all contain bullets, and are all means for multiplying deaths. The field-gun mows down its hundreds by showers of case at close quarters, or at longer distances rains bullets from the bursting shrapnel. The mitrailleur or machine-gun, on the contrary, sends a large number of small projectiles independently, and with precision, to a considerable distance.

We may divide arms on the latter principle into two classes: First, those which discharge their bullets from a single barrel, fed by a many chambered breech; and, secondly, those in which each cartridge has its corresponding barrel, the charging and discharging of which is direct, and more or less simple. It is obvious that, for rough usage and continuous firing, it is better that a large number of rounds should be fired from a considerable number of barrels so placed as to support each other and add strength to the whole machine. The French Mitrailleuse, as well as the Belgian Montigny, belong to the second class, and the following brief description is equally applicable to both arms: The machine-gun consists of a cluster of barrels, either bound together or bored out of the solid, and mounted on the same principle as an ordinary field gun. At a few hundred yards, indeed, it would be difficult to distinguish between these weapons, as far as outward appearance goes. To the barrel is attached a massive breech action, capable of being opened and closed by a lever. In the Montigny arm the cartridges are carried in steel plates perforated with holes corresponding in number and position to the holes in the barrel. This steel plate, in fact, forms the "vent piece" of the system. The central fire cartridges being dropped into the holes in the steel plate, stand out at right angles from it, and the plates, thus ready charged, are so carried in limber and axle-tree boxes specially fitted for their reception. When the gun comes into action the breech is drawn back, a steel plate full of cartridges is dropped into its corresponding slot, and the breech block thrust forward and secured. The gun is now on full cock, and contains from thirty to forty cartridges, which are fired by a "barrel organ" handle, either one by one as the handle works round click-clack, or in a volley by a rapid turn of the wrist. When the gun is empty the breech block is again withdrawn; the steel plate, carrying the empty cartridge cases, lifted out, and a fresh plate dropped in, if necessary.—*London Globe.*

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106,105.—NON-CONDUCTING CASING FOR BOILERS, STEAM-PIPES, &c.—Frances Y. Arnold, Philadelphia, Pa.
106,106.—MACHINE FOR TRIMMING AND SHEARING HAIR-CLOTH, &c.—Olney Arnold and Isaac Lindsley, North Providence, R. I., assignors to Pawtucket Hair-cloth Company.
106,107.—ANIMAL-TRAP.—William Ball, Oregon, Mo.
106,108.—RAKE-ATTACHMENT FOR HARVESTERS.—Charles Barns, West Liberty, Iowa.
106,109.—SUPPORT FOR TABLES.—James Blake, Scranton, Pa., assignor to himself and George Blake, same place.
106,110.—SUPPORT FOR TABLES.—James Blake, Scranton, Pa., assignor to himself and George Blake, same place.
106,111.—HAMES-CAP FOR HARNESS.—Lot Bonine, Vandalia, Mich., assignor to himself and Warren W. Camp, same place.
106,112.—PREPARATION OF ALBUMEN.—Gustave Bourgade, New York, N. Y.
106,113.—WATER-COOLER, &c.—George R. Bowman, Hagerstown, Md.
106,114.—SHUTTER-WORKER.—Henry W. Boynton, Haverhill, Mass.
106,115.—KETTLE-BAIL.—James Britton, Williamsburg, N. Y., assignor to himself and Garrett Brower, same place.
106,116.—MECHANISM FOR ACTUATING THE PICKER STAFF IN LOOMS.—Micajah C. Burleigh, Somersworth, N. H.
106,117.—MILE-SAFE.—James H. Bush, Bengal, Mich.
106,118.—CULTIVATOR AND HARROW.—Erastus T. Russell, Indianopolis, Ind., assignor to himself and John N. Greene, same place, assignors for one-third their right to J. M. Tilford, same place.
106,119.—RAILWAY CAR-COUPLING.—Solon O. Campbell, Centretown, Mo.
106,120.—BORING-MACHINE.—Wilson W. Carey and George W. Harris, Lowell, Mass.
106,121.—VALVE FOR STOP-COCKS.—Josiah W. Carney, Charlestown, Mass.
106,122.—PIPE-JOINT.—Patrick Clark, Rahway, N. J.
106,123.—SAW-HANDLE.—William Clemson, Middletown, N. Y.
106,124.—RAILROAD CAR-STOVE.—James M. Comins, New York, N. Y.
106,125.—MANURE-CART.—Thomas L. Cotten. Madison county, Miss., assignor to Martha J. Cotten, same place.
106,126.—SLEIGH AND CARRIAGE FOR CHILDREN.—Benjamin P. Crandall, Jr. Williamsburg, N. Y.
106,127.—MEDICAL COMPOUND AND LINIMENT.—W. S. Crooker, Shamburg, Pa.
106,128.—SPOOL-THREAD CASE.—John D. Cutter, NewYork, N.Y.
106,129.—DUPLEX WRENCH.—Augustus Ball Davis, Phila., Pa.
106,130.—DRAWING-FRAME FOR HEMP, &c.—George Davis and John R. Hoover, Elizabeth Port, N. J.
106,131.—RAILWAY SWITCH.—James Davis, New Orleans, La.
106,132, antedated August 4, 1870.—AUTOMATICALLY-OPERATED WATER-CLOSET-SEATS.—Perry W. Davis, Portland, Oregon.
106,133.—APPARATUS FOR REDUCING FIBROUS MATERIAL TO A TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.
106,134.—ATTACHMENT TO PAPER-MACHINES TO PREVENT THE STRAINING AND BREAKING OF THE PAPER DURING MANUFACTURE.—Lorenzo Dean, Fort Edward, N. Y.
106,135.—BOILER FOR REDUCING FIBROUS MATERIALS TO TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.
106,136.—CLOTHES-WRINGER.—Charles H. De Knight, Pittsburg, Pa.
106,137.—WASHING-MACHINE.—Charles H. De Knight, Pittsburg, Pa.
106,138.—NUT-LOCK.—James Dennis, Churchville, N. Y.
106,139.—PLANING-MACHINE.—Frank Douglas, Norwich, Conn.
106,140.—SPINNING-RING.—William F. Draper, Hopedale, Mass.
106,141.—ELECTRO-MAGNETIC LOW-WATER ALARM FOR STEAM-BOILER.—Wright Duryea, Glen Cove, N. Y.
106,142.—ELECTRO-MAGNETIC LOW-WATER DETECTOR FOR STEAM-BOILER.—Wright Duryea, Glen Cove, N. Y.
106,143.—MANUFACTURE OF PAPER PULP.—Asahel K. Eaton, Piermont, N. Y.
106,144.—WASHING-MACHINE.—William Eaton, Norwich, N. Y.
106,145.—PIANO FORTE.—Loring Farnsworth, Nashua, N. H., assignor to himself and William H. Flinn, same place.
106,146.—AUTOMATIC REEL FOR CLOTHES-LINE.—William Farrah, Des Moines, Iowa.
106,147.—APPARATUS FOR DRYING PHOSPHATES.—Ernst Frank and John B. Adt, Baltimore, Md.
106,148.—TRUSS.—Henry Fuller, Cattaraugus, N. Y.
106,149.—DEVICE FOR PACKING BOTTLES.—George C. Furber, Yreka, Cal.
106,150.—LUBRICATOR.—William Gee, New York, N. Y,
106,151.—TUCK-CREASING ATTACHMENT FOR SEWING-MACHINES.—Harry C. Goodrich, Chicago, Ill.
106,152.—CAR-BRAKE.—Merritt W. Griswold, New York, N. Y.
106,153.—SCROLL-SAW.—Nicholas B. Hadley. Providence, R. I.
106,154.—STOVE-GRATE.—Robert Ham Troy, N. Y., assignor to Cox, Church & Co., same place.
106,155.—HEMMER FOR SEWING-MACHINE.—Milo Harris, Jamestown, N. Y.
106,156.—FARM-GATE.—Amasa Hathway, Prairie Du Lac, Wis.
106,157.—SKY-LIGHT.—George Hayes, New York. N. Y.
106,158.—MANURE DRAG.—Josiah D. Heebner, Norrittonville, Pa., assignor to himself and David S. Heebner, same place.
106,159.—RAILWAY CAR-COUPLING.—Jacob Wilson Hess, Montandon, Pa.
106,160.—MACHINE FOR TURNING LOGS.—William E. Hill, Erie, Pa.
106,161.—CULTIVATOR.—Seth B. Hoisington, Galesburg, Ill.
106,162.—APPARATUS FOR THE MANUFACTURE OF BESSEMER STEEL.—Alexander L. Holley, Brooklyn, N. Y.
106,163.—BALANCE.—Woodbury Storer How, Cincinnati, Ohio.
106,164.—SAD AND CRIMPING IRON.—C. Hyatt, Buffalo, N. Y.
106,165.—ROTARY BLOWER.—William G. Hyndman, Cincinnati, Ohio.
106,166.—BILLIARD-CUE.—Martin V. Ingersoll, Norwalk Bridge, Conn.
106,167.—MACHINE FOR SHARPENING HARVESTER-CUTTERS.—W. S. Ingraham, Evanston, Ill.
106,168.—BUNG-BORER.—William A. Ives, New Haven, Conn.
106,169.—HINGE.—William Johnson, Milwaukee, Wis.
106,170.—HINGE.—Frank B. Jones, Louisville, Ky.
106,171.—PROCESS OF SEPARATING NAILS FROM FELT.—William Jones, New York, N. Y.
106,172.—MACHINE FOR BENDING CLEVIS AND STIRRUPS.—William C. Kaiser, Louisville, Ky.
106,173.—LAMP-SHADE AND REFLECTOR.—James M. Kenerson, Newport, N. H., assignor to himself and Edmund Burke, same place.
106,174.—PLATFORM-SCALES.—Michael Kennedy, NewYork, N.Y.
106,175.—ATTACHING RUBBER TO WRINGER-SHAFTS.—Silas R. Kenyon, Greenville, R. I., assignor to himself and William D. Vernam, Elizabeth, N. J.
106,176.—SHUTTER-FASTENER.—J. W. King, New York, N. Y.
106,177.—GRAIN-SEPARATOR AND SCOURER.—William C. Knox, Jacksonville, Ill.
106,178.—SLEEPING CAR.—George S. Koontz and John B. Hill, Washington, D. C.
106,179.—BELT-GUIDE.—Charles P. Leavitt, New York, N. Y.
106,180.—PRESSURE-GAUGE.—Charles Liedke, Sandusky, Ohio.
106,181.—STABLE-CLEANER.—Thomas F. Longaker, Philadelphia, Pa.
106,182.—EGG-BEATER.—Thomas Marsh and James Berney, Pawtucket, R. I.
106,183.—FENCE.—David McCurdy, Ottaowa, Ohio.
106,184.—GRAIN-SCOURING MACHINE.—William McLaughlin, Jersey City, N. J.
106,185.—STEAM-ENGINE.—Joseph R. Merriam, Sandusky, Ohio.
106,186.—METALLIC HEEL FOR BOOTS AND SHOES.—Edgar T. Miller, Albany, N. Y., assignor to himself and John Hewitt, same place.
106,187.—SAW.—Charles Mitzelfield, Detroit, Mich., assignor to Mark Flannigan, same place.
106,188.—MACHINE FOR BENDING AND PUNCHING CAR-HOOKS.—David G. Morris, Catasauqua, Pa.
106,189.—WATER-ELEVATOR.—Thomas Lafevda Morriss, Claypool, Ky.
106,190.—PROCESS OF FORGING CARRIAGE-SHACKLES.—Francis B. Morse, Plantsville, Conn.
106,191.—BASE-BURNING FIRE-PLACE HEATER.—Andrew Murdock, Brooklyn, E. D., N. Y.
106,192.—ATTACHMENT TO PLOWS.—James W. Murfee, Havanna, Alabama.
106,193.—ATTACHING THE POINT TO THE SHANK OF SUBSOIL-PLOWS.—James W. Murfee, Havanna, Ala.
106,194.—HORSE-POWER.—James W. Murrell, Eldorado, Ark's.
106,195.—SUBSOIL PULVERIZER.—Godfrey S. Newsom, Nashville, Tenn.
106,196.—SCRUBBING-BRUSH.—Jacob Odell, Petroleum Centre, Penn.
106,197.—ROCK-DRILL.—Hermann Osterkamp, Eschweiler city, Prussia.
106,198.—INK.—Charles F. Panknin, Charleston, S. C.
106,199.—VAPOR-BURNER.—R. W. Park, Philadelphia, Pa.
106,200.—VAPOR-BURNER.—R. W. Park, Philadelphia. Pa.
106,201.—STEAM-TRAP.—E. Lamson Perkins, Joseph H. Moulton, and Charles E. Sawyer, Boston, Mass.
106,202.—CORN-PLANTER.—George W. Pittman, Winona, Miss.
106,203.—ARCHING-BRICKS.—Watson F. Quinby, Wilmington, Delaware.
106,204.—CAR-COUPLING.—William A. Rex, and Joseph M. Rex, Jr., Butler, Ind.
106,205.—DRIER.—Jacob E. Rice, Moline, Ill., assignor to himself and Charles H. Remington, same place.
106,206.—AIR-HEATING STEAM-CONDENSER.—Peter J. Rice, Ashtabula, and David A. Scott, Cincinnati, Ohio.
106,207, antedated August 5, 1870.—MODE OF TREATING TOBACCO.—Samuel G. Rice, Albany, N. Y.
106,208.—COOKING-STOVE.—Francis Ritchie, Troy, assignor to Jewett & Root, Buffalo, N. Y
106,209.—APPARATUS FOR TANNING.—John Robinson, Samuel P. Robinson and Christopher C Putnam, Skowhegan, Me.
106,210.—BROILER.—David E. Roe, Elmira, N. Y.
106,211.—CURTAIN-FIXTURE.—Franklin Root, Hartford, Conn.
106,212.—APPARATUS FOR COOLING THE ROLLERS USED IN THE MANUFACTURE OF ISINGLASS.—Ebenezer Rowe, Rockport, Mass.
106,213.—LIQUID FOR RAISING PASTE OR DOUGH.—Arthur Sauer, Gustave Sauer, and Léonce Cachal, Paris, France.
106,214.—CIGAR-MACHINE.—Socrates Scholfield, Providence, R. I., assignor to himself and Richard A. Bright, Jr., same place.
106,215.—NUN-TAPPING MACHINE.—William Scully, Detroit, Mich., assignor to the Michigan Bolt and Nut Company, same place.
106,216.—APPARATUS FOR CARRYING GRAIN, PLASTER, &c., FOR SOWING.—Orson W. Smith, Flint, Mich.
106,217.—STEERING APPARATUS.—Geo. Seymour, London, Eng.
106,218.—MITERING MACHINE.—Ephraim Shaw, Tarr Farm, Pa.
106,219.—COMPOSITION FOR OILING WOOL.—James Shaw, Philadelphia, Pa., assignor to Conyers Button, same place.
106,220.—WASHING-MACHINE.—Morrill A. Shepard, Evansvile, Ind.
106,221.—BOX.—Charles J. Siercks, Chicago, Ill.
106,222.—STEAM-GENERATOR.—Edwin B. Sintzenich, Rochester, N. Y., assignor to himself and Henry G. Hamilton, same place.
106,223.—FLOUR-BOLT.—John Skinner, Hadley, Mich.
106,224.—LATHE-DOG.—John S. Skinner, Lebanon, N. H.
106,225.—DIE FOR FORGING CARRIAGE SHACKLE-BLANKS.—Willis B. Smith, Plantsville, Conn
106,226.—PUMP.—Peter M. Shell and Oscar Shell, Williamsburgh, Ohio.
106,227.—IRON FRAME FOR PIANOS.—Geo. Steck, New York, N. Y.
106,228.—FEEDING DEVICE AND PRESSER-FOOT FOR SEWING-MACHINES.—Charles M. Stoeker, Georgetown, Mass.
106,229.—COTTON AND HAY-PRESS.—Charles M. Stoppel, Houston, Texas.
106,230.—HORSE HAY-FORK.—Leverett W. Stuart, Narrowsburgh, N. Y.

106,231.—WATER-CLOSET.—William George Stuart, Springfield, Mass., assignor to John H. Trafton, same place.
106,232.—PHOTOGRAPH ALBUM.—Jesse F. Tapley, Springfield, Mass.
106,233.—REFINING PETROLEUM.—Joseph A. Tatro, Hartford, Conn.
106,234.—BOOK-BINDING.—Jabez C. Terry, Springfield, Conn.
106,235.—CULTIVATOR.—James H. Tibbits, Portland, Mich., assignor to himself and Joseph Stebbins, same place.
106,236.—AUTOMATIC TABLE-FAN OR BRUSH.—Robert E. Tolar and William D. Orr, Newnan, Ga.
106,237.—COCK.—John W. Trafton, Springfield, Mass.
106,238.—STUMP-PULLER.—Grey Utley, Charlotte, N. C., assignor to himself and Glenn & Wright, Atlanta, Ga.
106,239.—MEDICAL COMPOUND OR PILL.—Joseph P. Waddell, Brookhaven, Mass.
106,240.—SHOW-CASE.—Edward Watson and Richard H. Norris, Paterson, N. J.
106,241.—WIRE FOR ATTACHING SOLES TO BOOTS AND SHOES.—William Wickersham, Boston, Mass.
106,242.—SEWING-MACHINE TABLE.—Charles H. Wilcox, New York, N. Y., assignor to Wilcox & Gibbs Sewing Machine Company, New York City.
106,243.—CAST IRON CAR WHEEL.—Wm. Wilmington, Toledo, Ohio.
106,244.—EARTH-CLOSET.—Joel Wood, Martinsville, Ohio,
106,245.—TWEER.—Edmund Youngs, New York, N. Y.
106,246.—MAGAZINE GUN.—Nathan H. Ambler, East Cleveland, Ohio.
106,247.—MICA CHIMNEY FOR LAMPS.—John Baird and Warren Fisher, Hamilton, Ohio.
106,248.—SHADE CORD RETAINER.—William Henry Bechtel, Philadelphia, Pa.
106,249.—SEWING-MACHINE.—Joseph Bennor, Philadelphia, Pa., assignor to himself and Abraham Rex, same place.
106,250, antedated August 3, 1870.—SAUSAGE-STUFFER AND LARD-PRESS.—Abner Bishop, Smithville, Ohio.
106,251.—PROCESS OF FORMING VACUUM IN FREEZING APPARATUS. Edward S. Boynton, Meriden, Conn., assignor to himself and Charles Parker, same place.
106,252.—HOP-PRESS.—Jeremiah Brockway, Richland Centre, Wisconsin.
106,253.—PRUNING-SHEARS.—Ranson Bullard and George E. Mills, Litchfield, Miss.
106,254.—HANDLE FOR KNIVES, &c.—Matthew Chapman, Greenfield, Mass.
106,255.—SEAL-LOCK.—Everett Clemons, Catawissa, Pa.
106,256.—RAILWAY RAIL-FASTENING.—John Cochrane, Farmingdale, N. J.
106,257.—MACHINE FOR SOLDERING METALLIC VESSELS.—Edward T. Covell, Brooklyn, N. Y.
106,258.—SAFETY-SHOE FOR RAILWAY-CAR TRUCK.—John S. Crary, Salem, Mass.
106,259.—SWITCH-STAND.—Charles C. Dodge, Marshall, Mich.
106,260.—MACHINE FOR MANUFACTURING HOOPS.—John B. Dougherty, Rochester, N. Y., assignor to himself, Robert E. Sherlock, Joseph C. Schauck, Albert G. Wheeler, and Patrick H. Lawler, same place.
106,261.—LUBRICATOR.—Isidore Dreyfus, New York, N. Y.
106,262.—TOY.—John G. Fine, Cincinnati, Ohio.
106,263.—MANUFACTURE OF ARTIFICIAL MARBLE.—George A. Frear, Chicago, Ill.
106,264.—MOLDING-MACHINE.—Thomas Glover, Philadelphia, Pa., assignor to Morris, Tasker, & Co., same place.
106,265.—CORE FOR CASTING AXLE-BOXES.—William H. Hawley, Utica, N. Y.
106,266.—RAILWAY-SWITCH.—James P. Herron, Atlanta, Ga.
106,267.—BELT-SHIFTING MECHANISM FOR LOOMS.—L. J. Knowles, Warren, Mass.
106,268.—DEVICE FOR OPERATING WINDOWS.—James S. Lester, Knoxville, Tenn.
106,269.—STOVE-PIPE.—William P. Lewis and Silas L. Vera, Pittsburg, Pa.
106,270.—APPARATUS FOR EVAPORATING.—Norman R. Martin, Canandaigua, N. Y.
106,271.—GRINDING-MILL.—Gove Mitchell, Philadelphia, Pa.
106,272.—BLIND-FASTENING HINGE.—John H. Nevins, Brooklyn, E. D., N. Y., assignor to William A. Boshman, same place.
106,273.—MOLDING AND VENTING MACHINE.—William Newsham, Philadelphia, Pa., assignor to Morris, Tasker & Co., same place.
106,274.—APPARATUS FOR LOADING WOOD ON RAILWAY-CARS.—Jesse Nicholson, Monticello, Ind.
106,275.—ORGAN BELLOWS.—Joseph R. Perry, Wilkesbarre, Pa.
106,276.—MACHINE FOR HUSKING CORN.—Peter Philip, Stockport, N. Y.
106,277.—HEDDLE-MACHINE.—Peter Philip, Stockport, N. Y.
106,278.—HINGE.—John Plant, Washington, D. C.
106,279.—SASH-HOLDER.—James A. Printz, Reading, Pa.
106,280.—BROILER.—James T. Page, Rochester, N. Y.
106,281.—PLANING-MACHINE.—G. T. Pearsall, Apalachin, N. Y.
106,282.—PREPARATION OF LIME AND MORTAR.—Leman B. Pitcher, Salina, N. Y.
106,283.—MILLSTONE-BEARING.—Peter Plamondon, Atchinson, Kansas.
106,284.—HOISTING-APPARATUS.—Thomas Pollard, Philadelphia, Pa., assignor to J. V. Merrick, W. H. Merrick, and J. E. Copp, same place.
106,285.—BOOK-HOLDER.—Elias Propst and James F. Avis, Tipton, Ind., assignors to themselves and William H. Hartley, same place.
106,286.—CHILDREN'S CARRIAGE.—Günther Fridrich Carl Rosenthal, Philadelphia, Pa.
106,287.—APPARATUS FOR FORCING WATER.—James M. Rucker, Forrest Depot, Va.
106,288.—COMBINED BROILER AND FURNACE.—John S. Runyan, Columbus, Ohio.
106,289.—ROLL FOR FLUTING MACHINES.—Henry Sauerbier, Newark, N. J., assignor to Susan R. Knox and Daniel Jackson, New York city.
106,290.—MACHINE FOR THE MANUFACTURE OF COMPOSITION PIPES FOR DRAINAGE.—Robert Skinner and Richard Gaines, San Francisco, Cal.; said Gaines assignor to said Skinner.
106,291.—CUTTER-HEAD.—George E. Somers, Waterbury, Conn.
106,292.—SHIFTING BUGGY-TOP.—G. Stricker, Catawissa, Pa.
106,293.—ATTACHING AND DETACHING HORSES FROM VEHICLES.—George Switzer, Washington, D. C.
106,294.—WHEEL-PLOW.—John E. Swallow, Hagerstown, Md.
106,295.—MACHINE FOR BENDING TUBE-SKELPS.—Stephen P. M. Tasker, Philadelphia, Pa.
106,296.—WASHING-MACHINE.—William H. Welch, Bloomington, Ill.
106,297.—CAR-SEAT.—William Wells, Salem, Mass.
106,298.—BOX OR CASE FOR HOT-BEDS.—William Wells, Salem, Mass., assignor to himself, E. B. Horton, and David Beffum, same place.
106,299.—STOPPING MECHANISM FOR SPINNING AND OTHER MACHINES.—Samuel B. Wescott, River Point, R. I.
106,300, antedated August 5, 1870.—SHEARING AND PUNCHING MACHINE.—Josiah C. Wilcox, New London, Wis.
106,301.—WASHING-MACHINE.—Joseph Bearford Wilson, Philadelphia, Pa., assignor by mesne assigments, to himself, Philip W. Lawrence, and Walter Reckless.

REISSUES.

4,092.—PLANTING-MACHINE.—Samuel Leeds Allen, Cinnaminson, N. J.—Patent No. 84,247, dated November 24, 1868.
4,093.—BRIDGE.—Albert Fink, Louisville, Ky.—Patent 63,714, dated April 9, 1867.
4,094.—SPINDLE FOR SPINNING.—Albert H. Gilman, Boston, Mass.—Patent No. 66,017, dated June 25, 1867.
4,095.—COMPOSITION FOR COVERING STEAM-BOILERS AND FOR OTHER PURPOSES.—Ferdinand Leroy, administrator, and P. A. Victor Le Lubez, assignee of Ferdinand Leroy, deceased, London, England.—Patent No. 97,761, dated December 14, 1896.
4,096.—SAW.—Elisha P. Wheeler, Edward M. Madden, and William Clemson, Middletown, N. Y., assignees of Joseph H. Tuttle.—Patent No. 9,807, dated June 21, 1853; extended seven years.
4,097.—EXTENSION WASH-BENCH.—Samuel Wiswall, Hyde Park, Vt., assignor to Albert H. Spencer, Providence, R. I.—Patent No. 30,371, dated October 9, 1860.

DESIGNS.

4,275.—TOP PLATE FOR MANAGERS.—Samuel S. Bent, Port Chester, N. Y.
4,276.—SPOOL-STAND.—Robert Gordon, Peoria, N. Y.
4,277.—COLLAR-BOX.—Samuel F. Hilton, Providence, R. I.
4,278.—CLOCK-CASE FRONT.—Samuel B. Jerome, New Haven, Conn., assignor to Samuel Peck & Co., same place.
4,279.—TYPE.—William H. Page, Norwich, Conn., assignor to Wm. H. Page & Co., same place.
4,280.—TYPE.—William H. Page, Norwich, Conn., assignor to Wm. H. Page & Co., same place.
4,281.—TYPE.—William H. Page, Norwich, Conn., assignor to Wm. H. Page & Co., same place.
4,282.—TYPE.—William H. Page, Norwich, Conn., assignor to Wm. H. Page & Co., same place.
4,283.—TYPE.—William H. Page, Norwich, Conn., assignor to Wm. H. Page & Co., same place.
4,284.—TYPE-BORDER.—William H. Page, Norwich, Conn., assignor to Wm. H. Page & Co., same place.
4,285.—TYPE-BORDER.—William H. Page, Norwich, Conn., assignor to Wm. H. Page & Co., same place.
4,286.—NECK-YOKE RING AND SLIDE.—Robert L Reat, Charleston, Ill.
4,287.—GROUP OF STATUARY.—John Rogers, New York, N. Y.
4,288.—SAUSAGE-FILLER.—Amos Shepard, Southington, Conn.
4,289.—TYPE.—Richard Smith, Philadelphia, Pa., assignor to McKellar, Smiths & Jordan, same place,
4,290.—CLOCK-CASE FRONT.—S. C. Spring, Bristol, Conn.
4,291.—INKSTAND.—Levi L. Tower, Somerville, Mass.
4,292.—INKSTAND.—Henry Whitney, East Cambridge, Mass.

Fire Protection for New York Harbor.

AN article appeared in the *Times*, a few days since, stating the dangers from fires upon our docks and among our shipping, mentioning the fire-boats used in some foreign ports, and at the same time deploring the fact that we have nothing of the kind, and urging the introduction of such protection. This was going a step too far. New York is, perhaps, as well provided against fire as any other port in the world. It certainly has one wrecking and fire-steamer, which, according to the report of an English fire-engineer, is more powerful than any fire-boat on the Thames. We refer to the *John Fuller*, owned by Messrs. JOHN C. BAXTER & SON. This boat, which we have previously described in the ENGINEERING AND MINING JOURNAL, was built expressly for a wrecking and fire-steamer. After one of her immense pumps had been in use some five years, it was decided to double her power by putting in another. They are the well-known Hardick Niagara Pumps, and were built by Mr. C. B. HARDICK, of Brooklyn, for this especial service, under the personal supervision of Mr. BAHLER, the chief engineer of the steamer. These pumps, so well known on shore, have here had an opportunity of showing how they can stand the wear and tear of hard work. In some cases they have been driven day and night, eighteen days in succession. Last winter, a propeller sunk in the North river. The *Fuller* went alongside, and after getting her "suctions" into the steamer, and battening up such holes as could be got at, the pumps were started at their full speed and driven so as to take nearly all the steam the boiler could furnish. The result was that the wreck floated, was towed down the river and put on the Dry Dock in spite of the enormous leaks that could not be stopped. Such tests as these show the value of a steam-pump capable of throwing 8,000 gallons of water per minute.

A Pennsylvania Narrow Guage Railroad.

A CORRESPONDENT of *Van Nostrand's Engineering Magazine* gives the following account of a narrow gauge railroad connected with the Thomas Iron Works at Hokendauqua, Pa., which was built to carry cinders from the blast furnaces: "The road is 2 feet 6 inches gauge, and is the same as when we used horse-power. The engines were built by Messrs. M. BAIRD & Co., at the Baldwin Locomotive Works, in Philadelphia. The steam cylinders are 9 inches diameter, and 12 inches stroke; driving wheels 30 inches diameter with steel tires two inches thick. In order to economize room, we ascend very rapidly to the tip or dump, and a portion of the road has a gradient of 4 feet in 100 feet, or 211 feet per mile. Our cinder cars are four-wheeled, weighing when loaded 3 tons 5 cwt., gross; wheels only 16 inches diameter. The engines weigh, when ready for work with tank full of water, 8 tons 4 cwt., gross. One of them will haul with ease up this gradient of 211 feet per mile, 8 tons of the cinder cars, making an aggregate of 26 tons, and that with a boiler pressure of only 120 to 125 pounds per square inch."

Krupp Steel.

MESSRS. THOMAS PROSSER & SON, American Agents for FRIEDRICH KRUPP, issue a circular, containing a little pardonable self-congratulation over the excellent performances of the Prussian artillery, from the great Essen manufactory. We are sorry to learn from the same document that two thousand of KRUPP's workmen have been taken for military service, and that the war interferes also in other ways with the punctual delivery of goods contracted for in this country. We trust the force remaining at the works will prove sufficient, as Messrs. PROSSER declare, to execute all orders anticipated, and that this splendid business will suffer no more than temporary inconvenience from the political and military disturbance of Europe.

Mineral Land for Sale.

THE attention of our readers is directed to an advertisement in another column, of some mineral and farming property for sale in Orange Co., N. Y. We understand that this is an opportunity for capitalists worthy of special investigation.

BUSINESS AND PERSONAL.

[Short notices in this column fifty cents per line each insertion.]

GLYNN'S ANTI-INCRUSTATOR FOR STEAM BOILERS.—THE only and reliable article for removing and preventing incrustation. No foaming, and does not attack metals of boiler. Liberal terms to agents, C. D. FREDRICKS, 587 Broadway, N. Y.
April 19 tf.

IMPORTANT TO INVENTORS.

WESTERN AND CO.'S PATENT AGENCY.

CHARLES ROGERS, Solicitor and Manager.

In connection with the publication of the ENGINEERING and MINING JOURNAL and the MANUFACTURER AND BUILDER, we have frequently received applications from subscribers and patrons to act as their agents in transacting business with the United States Patent Office; and in view of the increasing number and urgency of such requests, we have resolved to add this department to our business. We have accordingly organized

A COMPLETE PATENT AGENCY,

and now offer our services in procuring patents in this and foreign countries, and transacting all business relating to the obtaining of patents.

Being possessed of superior facilities, in connection with our associate attorneys in Washington and foreign countries, for the successful prosecution of this business, we do not hesitate to guarantee satisfaction to all who may entrust their business to our care.

We have engaged as solicitor and manager Mr. CHARLES ROGERS, a well-known expert in this department. Being a practical mechanic, and having been an examiner in the Patent Office at Washington for a number of years, besides enjoying an experience of more than twenty years as a solicitor of patents, Mr. ROGERS is intimately acquainted with all the details of the business, both in and out of the office.

The specifications, drawings, etc., prepared in our office, will be found to compare favorably with those prepared by any other establishment, while the intimate acquaintance of our manager with the routine of business in the Patent Office, gives us a decided advantage in managing difficult cases.

We are fully prepared to prosecute Rejected Cases and Cases in Interference and Infringements, and also to procure Reissues and Extensions of Patents.

We can also furnish Models for use in the Patent Office, to parties who may desire it, as we have made arrangements for this purpose with one of the most skilful machinists in this country, who possesses every facility for getting up models in the most perfect manner, at short notice, and on reasonable terms.

We shall give special attention to the prosecution of Rejected Applications, which have been improperly prepared by the inventor or incompetent attorneys.

We shall be ready at all times to furnish all necessary information and advice to intending applicants, and give our opinion as to the patentability of their inventions, free of charge; and we make it a rule never to take charge of a case unless we see a reasonable probability of obtaining a patent without first giving the inventor our candid opinion as to the probable result of the application.

OUR CHARGES.

Our charges are as moderate as those of any other responsible patent attorneys, as will be seen from the following figures: For preparing a case (whether simple or complicated) and attending to its passage through the Patent Office, our fee is from $30 to $40, which includes all the necessary papers and drawings. If the application is rejected we make no further charge, but prepare all necessary amendments, and, if requisite, appeal to the Board of Examiners-in-Chief. Most Patent Attorneys make an additional charge on each adverse action of the Patent Office, but we have found it more satisfactory to all parties interested to make our full charge at first; and as we expect no contingent fees, it is to our interest to prepare our cases properly at the commencement, thus avoiding annoyance to ourselves and delay in getting out the patent.

The cost of getting out a patent through our agency is—	
For first Government fee, stamp, etc.	$16
" our fee	$30 to 40
" final Government fee	20
Total	$66 to $76

If the case has to be appealed, the applicant pays the Government fee on appeal, $10; but we shall ordinarily make no additional charge for our services. The first two items are payable when the application is sent in, and the second Government fee when a patent has been allowed. Before an appeal is taken, in any case, the applicant will be fully advised of all facts and charges, and no proceedings had without his sanction; so that all inventors who employ our agency will know in advance what their applications and patents are to cost.

For Rejected Applications prepared by others, our charges vary somewhat according to the nature of the case, but are generally as follows:

In advance, on receiving the case	$10
When the patent is allowed	$20 to 30
Total	$30 to $40

the applicant paying such Government fees as may be required.

For preparing and filling a Caveat,

Our fee is	$15
Government fee	10
Total	$25

For attending to the obtaining of Releases, Extensions, etc., and preparing Assignments, our charges vary according to the labor involved.

We are possessed of all the facilities for the successful prosecution of applications for patents in Great Britain, France, Belgium, and other foreign countries, on favorable terms.

Inventors who reside out of New York, and wish to procure a patent, need not go to the expense of visiting this city or Washington, but may send us a model of their invention, or a sketch and brief description; this will enable us to decide as to its probable novelty and patentability, and we can proceed at once to prosecute the case. We shall, however, be glad at all times to see our friends from any section, and give them such information as we are possessed of relating to patents, free of charge. A Post-office order for $16, to pay the first Government fee and stamp duty, should be sent along with the model; our fee $30 to $40, being payable as soon as the application is ready to be sent to Washington.

Patents granted through this agency will be described and illustrated in the columns of the ENGINEERING AND MINING JOURNAL or the MANUFACTURER AND BUILDER, without further charge to the inventor than the cost of the necessary cuts.

All communications to be addressed to

WESTERN & COMPANY,
P. O. Box, 5969. 37 PARK ROW, NEW YORK.

How Nitro-Glycerine is Kept and Used in the Hoosac Tunnel.

A correspondent of the Boston *Advertiser* tells us how the nitro-glycerine is kept at the Hoosac tunnel: "The 'glycerine,' as they call it, is delivered in solid form at the Shanly magazine at the west shaft, at the central shaft, and at the east end, being frozen and packed in ice. It is also sent to Connecticut and other points. There is never more than five hundred pounds in the magazine, and seldom more than three hundred. It is contained in earthen jars, on a low bench, a thin layer of water covering the dreaded oil. The magazine is cool and pleasant, but it is not a place where one would choose to sit and smoke during a warm afternoon. When the requisite number of holes for a blast have been drilled at the heading in the west end, which was first visited, word is sent to the surface, and the man who handles the glycerine brings it down in little tin cans containing a pound and a half each. Any man may handle gunpowder in a tunnel, but only a few are permitted to touch glycerine, and they do nothing else. The cans are inserted in the drilled holes, with the ends of the exploders inserted in the cork. The exploders are very innocent things away from glycerine, but very dangerous agents in its vicinity. The ends of the exploders are connected with wires extending to the battery far away. The workmen have meantime been removing the drill machines and the platform on which they rest, the rubber pipes which convey the compressed air, the tools and every other useful and destructible thing, to a distance of two hundred feet or more. The wires are then attached to the two poles of a magneto-electric battery, and a few turns of the crank are given. A faint thud, a puff of air striking the face, and the work is done. One of the men goes forward and carefully inspects all the holes to make sure that every one has been exploded, and having ascertained the fact, the miners come forward to renew their drilling and clear away the debris of the blast.

Advertisements.

The special advantages of the ENGINEERING AND MINING JOURNAL, *as a medium for advertisers, are so great and so widely known that it may seem almost needless to call attention to them. It is extensively circulated among the engineers of the country and takes a position in this respect before any other publication of the kind. It has a large and constantly increasing circulation among miners and mine owners, and men connected with mining operations generally. As it is the only paper in the country that makes this subject a specialty it has this field entirely to itself, and is the only direct and reliable means of reaching this class of persons. Being kept on file by almost every subscriber, it is dowbly valuable as a permanent means of keeping an advertisement before the public. It is the recognized organ of the coal trade, and is taken extensively by the trade throughout the country and presents the very best means of reaching that very important class of men.*

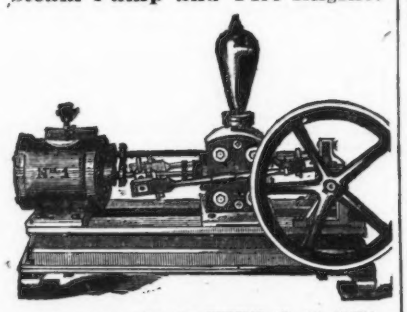
Rates of Advertising.

The rate of advertising, compared with those of other weekly industrial publications, are very low, especially when the class of consumers among which its large circulation is almost entirely confined, is taken into consideration.

Back Page.....40 cents a line.
Inside Pages.....25 cents a line.
Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

STEAM PUMPS.

THE WOODWARD
Steam Pump Manufacturing Company.
MANUFACTURERS OF THE
WOODWARD PATENT IMPROVED SAFETY
Steam Pump and Fire Engine.



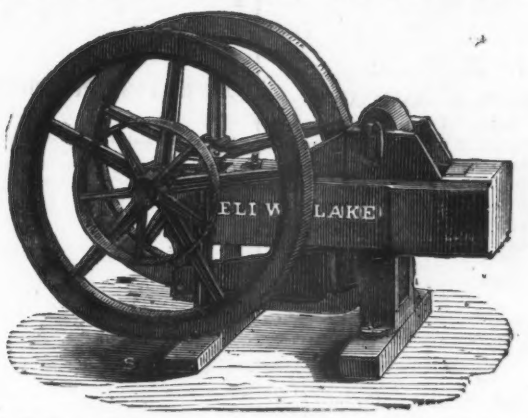
STEAM, WATER, AND GAS FITTINGS OF ALL KINDS.
Also dealers in WROUGHT IRON PIPE, BOILER TUBES, etc. Hotels, Churches, Factories, and Public Buildings, heated by Steam, Low Pressure.
Woodward Building, 76 and 78 Centre street, corner Worth street, New York. Formerly 77 Beekman street.
mar 14-1y GEORGE M. WOODWARD, Pres't.

J. CLAYTON'S
Patent Fly Wheel and Direct Action
STEAM PUMPS,
HAND PUMP AND
STEAM ENGINE
COMBINED.

These pumps are the cheapest first-class pumps in the market.
All sizes made to order at short notice.
JAMES CLAYTON, 24 & 26 Water st.,
Nov18-tf Brooklyn, N. Y.

MISCELLANEOUS.

BLAKE'S STONE BREAKER. .



The office of this Machine is to break Ores and Minerals of every kind into small fragments, preparatory to their further comminution by other machinery.
This machine has now been in use, enduring the severest tests, for the last ten years, during which time it has been introduced into almost every country on the globe, and is everywhere received with great and increasing favor as a labor-saving machine of the first order.
Illustrated circulars, fully describing the machine, with ample testimonials to its efficiency and utility, will be furnished on application, by letter to the undersigned.
☞ The Patents obtained for this machine in the United States and in England having been fully sustained by the courts, after well contested suits in both countries, all persons are hereby cautioned not to violate them; and they are informed that every machine now in use or offered for sale, not made by us, in which the ores are crushed between upright convergent faces or jaws actuated by a revolving shaft and fly-wheel, are made and used in violation of our patent.
Mch. 14-1y. **BLAKE BROTHERS, New Haven, Conn.**

JOHN A. GRISWOLD, ERASTUS CORNING. ERASTUS CORNING, JR., CHESTER GRISWOLD.
JOHN A. GRISWOLD & CO.,
PROPRIETORS OF THE
RENSSELAER IRON WORKS,
TROY, N. Y.
Bessemer Steel Works, Fort Edward Blast Furnace and Columbia Blast Furnace.
MANUFACTURERS of PIG IRON, RAILROAD, MERCHANT AND SHIP IRON,
Bessemer Steel Rails, Axles, Tyres, Shafting Plates and Steel Forgings,
OF ALL DESCRIPTIONS.
Office in New York, No. 56 Broadway.
May 17:1y

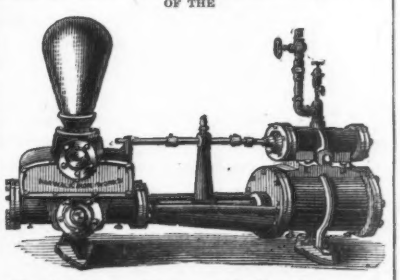
NEW JERSEY ZINC COMPANY.
B. S. GIBLIN, Treasurer. GEORGE A. BELL, President
WORKS NEWARK, N. J., OFFICE No. 61 MAIDEN LANE NEW YORK.
Franklinite Pig Iron (Spiegeleisen), Spelter, Oxide of Zinc, Spiegeleisen Cinder for Blast Furnaces.
May 24:1y

LEHIGH ZINC COMPANY.
GORDON MONGES, Treasurer. B. C. WEBSTER, President.
WORKS, BETHLEHEM, PA. OFFICE, 333 Walnut Street, Philadelphia.
JOHN JEWETT & SONS, AGENTS, 182 FRONT STREET, NEW YORK.
OXIDE OF ZINC, SPELTER, SHEET ZINC.
Jun28:1y

IMPROVED MINING AND WRECKING PUMPS.

LEBBY AND DUC PATENTS.
MANUFACTURED SOLELY BY
T. F. ROWLAND, CONTINENTAL WORKS,
Greenpoint, Brooklyn, N. Y.
New York Office, No. 64 Broadway, Room 33.
☞ Send for Illustrated Circular. july16-1y-is

NORWALK IRON WORKS,
SOUTH NORWALK, CONN.,
Sole Proprietors and Manufacturers
OF THE



Earle Steam Pump and Fire Engine,
(Patented in the United States, France, England and Belgium.)
Air and Vacuum Pumps,
STEAM AND BLOWING ENGINES,
Pumping Engines for Water Works, Horizontal and Tumbling Beam Engines, Mining, Wrecking, and Supply Pumps.
IRON AND BRASS CASTINGS, of every description.
☞ Send for Illustrated Catalogue. mch13-1y

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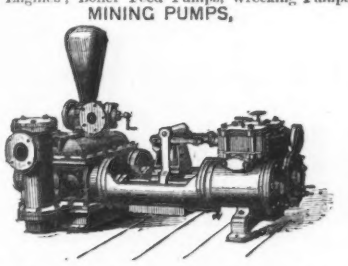
MANUFACTORY,
BROOKLYN, N. Y.
Steam Pumping Engines, Single and Duplex, Worthington's Patent, for all purposes, such as Water Works Engines, Condensing or Non-condensing; Air and Circulating Pumps, for Marine Engines; Blowing Engines; Vacuum Pumps, Stationary and Portable Steam Fire Engines; Boiler Feed Pumps, Wrecking Pumps,
MINING PUMPS,



Water Meters, Oil Meters; Water Pressure Engines; Stamp Mills for Gold, Silver and Copper Ore; Eaton's Patent Amalgamators for Gold and Silver; Steam and Gas Pipe, Valves, Fittings, etc. Iron and Brass Castings.
☞ Send for Circular.
H. R. WORTHINGTON,
feb1-1y 61 Beekman street, New York.

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LEHIGH COALS,
OFFICE:
43 and 45 TRINITY BUILDING, 111 BROADWAY,
NEW YORK. Jan:1y

WHITE, FOWLER & SNOW.
Wilkesbarre and Lehigh Coal,
FOR STEAM AND FAMILY USE.
OFFICE
Room No. 75, 111 BROADWAY, (Trinity Building).
JNO. WHITE,
jan1-1y LINDLEY H. FOWLER,
LOUIS T. SNOW.

WILKESBARRE COAL, DELIVERED DIRECT from the Mines of
The Wikesbarre Coal and Iron Co.,
or for re-shipment at
HOBOKEN AND JERSEY CITY.
OFFICE:
ap1-1y No. 80 Broadway, New York.

COAL SHIPPERS.

THE DESPARD COAL COMPANY OFFER their Superior DESPARD COAL to Gas Light Companies throughout the country.
MINES IN HARRISON COUNTY, West Virginia.
Wharves, Locust Point, } Baltimore.
Company's Office, No. 29 South st. }
AGENTS:
PARMELE BROTHERS, No. 32 Pine street, New York.
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Among the consumers of Despard Coal we name Manhattan Gas Light Co., New York; Metropolitan Gas Light Co., New York; Jersey City Gas Light Co., Jersey City, N. J.; Washington Gas Light Co., Washington, D. C. Portland Gas Light Co., Portland, Maine.
☞ Reference to them is requested. may30-1y

LEWIS AUDENRIED & CO., MINERS AND Shippers of the following celebrated
ANTHRACITE COALS.
From Philadelphia and the Mines,
DIAMOND, Red Ash; SPOHN, Red Ash; ORCHARD, Pink Ash; BROAD MOUNTAIN, White Ash; LOCUST MOUNTAIN, White Ash; BLACK HEATH, White Ash; Old Company's Lehigh; Wilkesbarre.
From Port Johnston and Jersey City,
Old Co.'s Lehigh, Hazleton, Wilkesbarre, and Shenandoah Coals.
Also the superior CUMBERLAND COALS.
BROAD TOP, BARTON, BARTON,
SEMI-BITUMINOUS, GEORGES CREEK, GEORGES CREEK,
at Philadelphia. at Baltimore. at Alexandria.
205 Walnut street, Philadelphia; 14 Kilby street, Boston
34 Westminster st., Providence; 24 Second st., Baltimore
110 BROADWAY, NEW YORK. Jan13.y

G. B. LINDERMAN & CO.,
MINERS,
Sugar Loaf, Lehigh Coal.
OFFICE, 50 TRINITY BUILDING, 111 BROADWAY,
may23-1y NEW YORK.

COXE BRO.'S & CO., CROSS CREEK COLLIERY, Miners and Shippers of the Celebrated
Cross Creek Free Burning Lehigh Red Ash
COAL.
FROM THE BUCK MOUNTAIN VEIN.
OFFICES;
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Drifton, Jeddo P. O., Luzerne Co., Pa.
Agent in New York, SAMUEL BONNELL, Jr.,
Room 43, Trinity Building,
feb-1y 111 Broadway.

THE FAIRMONT GAS COAL COMPANY, OF NEW YORK.
OFFICE
TRINITY BUILDING, 111 BROADWAY, ROOM NO. 71.
WHARVES AT
LOCUST POINT, BALTIMORE.
MINES AT
FAIRMONT, MARION COUNTY, WEST VIRGINIA.
The Fairmont Gas Coal Company, of New York, solicit the orders of Gas Companies for their VERY SUPERIOR GAS COAL.
The Coal from their mines is remarkably free from sulphur, and will be carefully mined and carefully shipped, free of slate and other impurities. This Coal has an illuminating power of 19 candles, yielding over 10,000 cubic feet of Gas to the ton, and an excellent Coke.
Refer to the Manhattan Gas Light Co., of New York, and the New York Gas Light Co., of New York.
N. MEYLERT, President.
HIRAM BENNER, Sec. and Treasurer. Ap5:2t

LOVE, BOYER & CO.,
SHIPPERS OF
Anthracite and Bituminous Coals,
AMERICAN BUILDINGS, No. 334 WALNUT STREET,
And Pier 19 Port Richmond. PHILADELPHIA.
Agents for Cumberland Vein Bituminous Coal.
Mar 8:6m

HONEY BROOK COAL COMPANY, Exclusive Miners and Shippers of the Celebrated
Honey Brook Lehigh Coal,
No. 111 BROADWAY, NEW YORK.
JAMES H. LYLES, Agent.
Wharves, Port Johnson, N. J. Philadelphia office, 209 Walnut street.
ap20-1y J. B. McCREARY, President.

RANDOLPH BROTHERS, Sole Agents of the original
Spring Mountain Lehigh Coal.
Extensively used for Smelting Iron.
☞ Rooms, 28 and 30 Trinity Building,
pr6tf NEW YORK.

POWELTON COAL AND IRON COMPANY, Sole Shippers of the Celebrated
Powelton Semi-Bituminous Gas
AND ANTHRACITE COALS,
104 Walnut street, Philadelphia.
BRANCH OFFICES:
New York, Trinity Building; 17 Doane street, Boston
Cleveland, O.; Pittsburgh, Pa. jan30-is

THE NEWBURGH ORREL COAL COMPANY.
Mines at Newburgh, Preston Co., W. Va.
Company's Office, No. 52 S. Gay St. Baltimore, Md.
C. OLIVER O'DONNELL.....President.
G. W. MAHOOL.....Secretary.
This Company offer their very superior Gas Coal at lowest market prices.
It yields 10,996 cubic feet of gas to the ton of 2,240 lbs., of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.
It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York, the Brooklyn and Citizens' Gas Light Companies of Brooklyn, N. Y., the Baltimore Gas Light Company of Baltimore, Md., and Providence Gas Light Company, Providence, R. I.
The best dry coals shipped, and the promptest attention given to orders. sep21-1y

MINERAL AND FARMING PROPERTY FOR SALE.—The Subscriber offers thirty acres of mineral land in Orange County, two and one-half miles from Monroe, on the Erie Railroad, by an easy and good carriage way. On the premises is a large and nearly new dwelling of modern style; a fine orchard, and good supply of small fruits. A vein of rich and profitable iron ore runs through the premises, and is now being worked on the adjoining lands by the Greenwood Iron Company. Also, near the above, eighteen acres, upon which is a valuable mine of Iron ore. For further information address NAT. W. HOWELL, Monroe, Orange County, N. Y. Aug. 16,4t

PUBLICATIONS.

NOW READY.

Third Edition, Seventh Thousand, Revised, Enlarged, and Improved,

HOPTON'S CONVERSATIONS on MINES,

BETWEEN

FATHER AND SON,

ENLARGED FROM 112 TO 192 PAGES.

The Following are the Contents:

Air, why it is propelled down, into and around the workings
" Quantity of, produced by the furnace.
" Friction of
" The great friction of produced by one mode of ventilation, and how reduced by another
" Pure added to impure (plans.
" Splitting of (plans)
" One current of (plans)
" One current of, and how to adopt separate currents (plan)
" Dividing of, but not into "separate and and distinct" current (plans)
" Crossings (see H on plans)
" Weight of in shafts
" How to find the weight of
" Table of pressure in shafts
" Expansion of
" Its velocity and force
" Rush of, into each division
" Quantity produced by natura ventilation
" Splitting, why it should be adopted
" Splitting, why the workmen object to Mr. Hopton adopting the mode
Anemometer, measurement of air by, engraving of
Area of a pit, how to find
Barometers, Showing the time of an outlet of gas in mines (engraving)
Bricks, how to find the number in the walling of a shaft.
Buddle's plan
Circumference of a pit, how to find
Coal, several ways of working it out, and why man methods of working it out are adopted
" Working out in banks (plans)
" Working it out in following up banks (plan)
" Working out in pillars (plans)
" Working out in long wall (plans)
" Working out in drifts (plans)
" Working out with no regularity (plan)
" Working out by the "end way" or in endings (plan)
Cubical Contents of a pit, how to find
Dialing, the mode of
Dials, several engravings
" How constructed
" How fixed in mine surveying
" Needle, its variations
Diameter of shaft
Dip of mine, how to find and lay on (plan)
Explosion, the power of an
" At Lund-hill, in what part of the mine it was supposed to take place (plan)
" How the power may be diminished
Furnace, how to find the horse-power of
" The place of fixing, to produce the largest ventilating current
" Engravings of ground floor, front and back view
" Remarks upon
Gases, (carbonic acid) composition of
" Do. properties of
" (After, or choke damp) composition of
" (Carburetted hydrogen) do.
" Choke damp and carbonic acid, not one and the same in quality
" The effect produced on people by inhaling such
" The quantity required for an explosive mixture
" The elasticity of
" The weight of
" The nature and quality of
" Why some mines generate and produce more than others
" Why some mines generate a mixture of
Goaf, or gob, how tramrods are made through (plan
Lund-hill (plan)
Managers, who are best competent to manage mines
Miscellaneous questions
Natural ventilation
Planning, how workings are laid on the plan
Regulations (see R on plans)
Safety Lamps, why flame will not penetrate through, engraving of
Sections on mechanical ventilation
Summary of accidents
Surveying, how mines are with the dial
Surveying, how mines are with the theodolite
Tables of weights and measures
Temperature on surface
Temperature in mines
Temperature, difference of between down and up-cast
Theodolites for mine surveying
Theodolites, how constructed
Theodolites, the magnetic needle dispensed with, and how workings are laid on plan, with Theodolite surveying
Theodolites, how mines are surveyed with them
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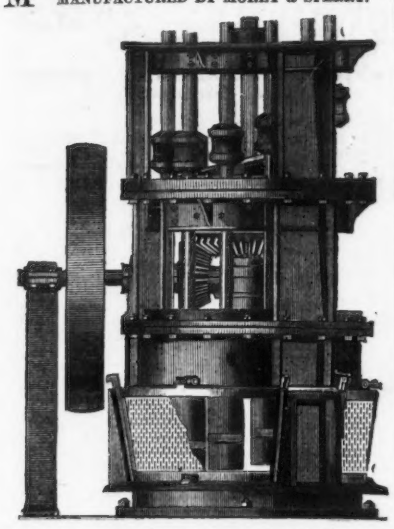

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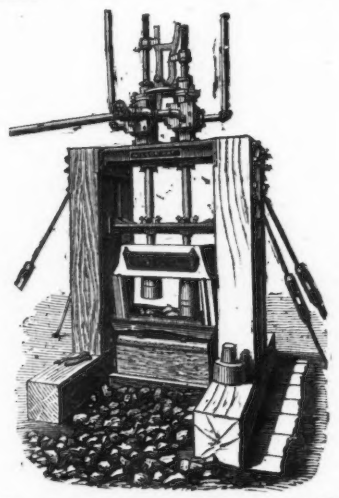

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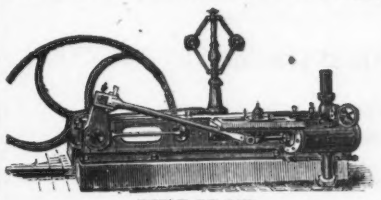

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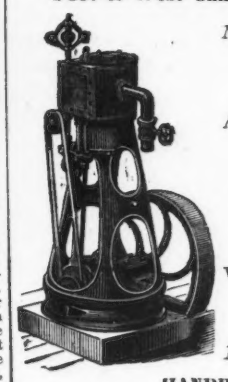

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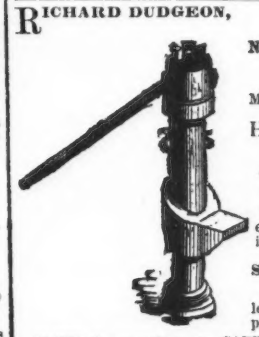

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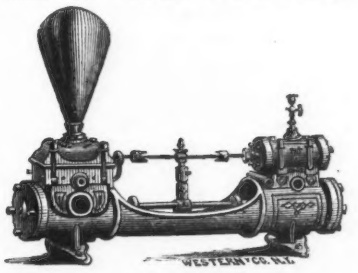

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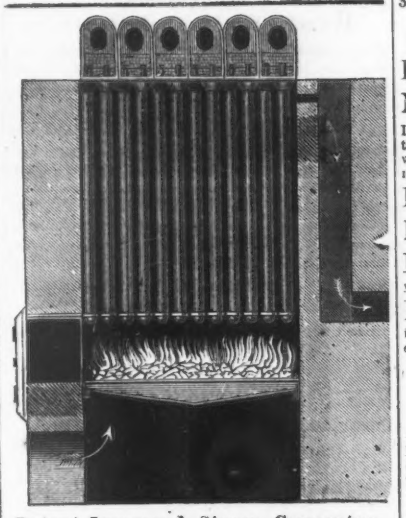

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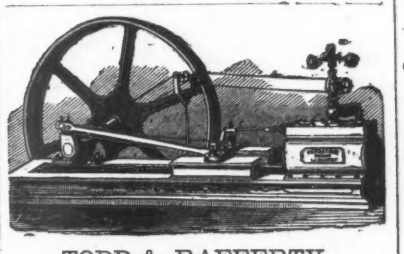

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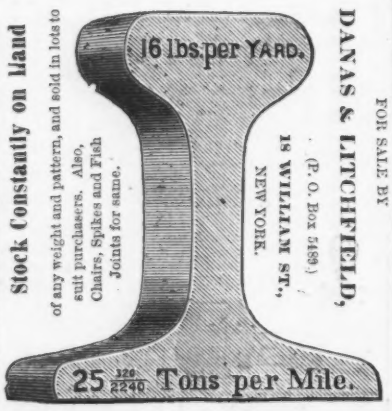
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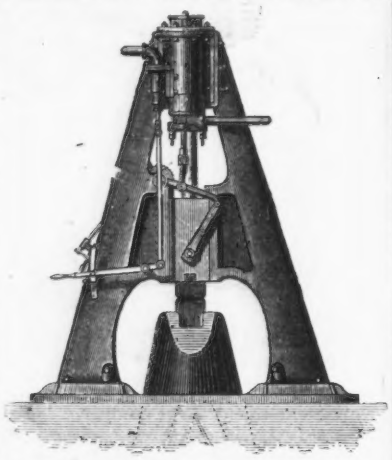

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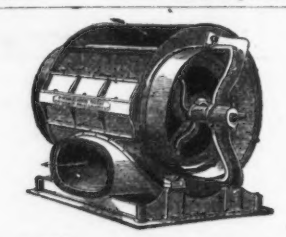

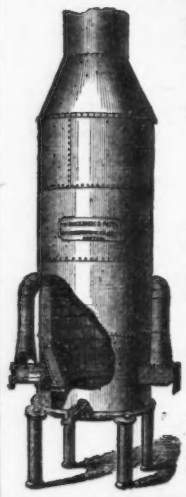

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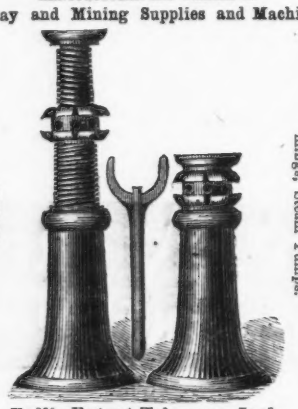

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